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(54) Title: NOVEL BONE MARROW NUCLEIC ACIDS AND POLYPEPTIDES

(57) Abstract:

NOVEL BONE MARROW NUCLEIC ACIDS AND POLYPEPTIDES**1. BACKGROUND OF THE INVENTION****5 1.1 TECHNICAL FIELD**

The present invention provides novel bone marrow-expressed polynucleotides and bone marrow-expressed proteins encoded by such polynucleotides, along with uses for these polynucleotides and proteins, for example in therapeutic, diagnostic and research methods.

10 1.2 BACKGROUND

Technology aimed at the discovery of protein factors (including e.g., cytokines, such as lymphokines, interferons, CSFs, chemokines, and interleukins) has matured rapidly over the past decade. The now routine hybridization cloning and expression cloning techniques clone novel polynucleotides "directly" in the sense that they rely on information directly related to the
15 discovered protein (i.e., partial DNA/amino acid sequence of the protein in the case of hybridization cloning; activity of the protein in the case of expression cloning). More recent "indirect" cloning techniques such as signal sequence cloning, which isolates DNA sequences based on the presence of a now well-recognized secretory leader sequence motif, as well as various PCR-based or low stringency hybridization-based cloning techniques, have advanced the
20 state of the art by making available large numbers of DNA/amino acid sequences for proteins that are known to have biological activity, for example, by virtue of their secreted nature in the case of leader sequence cloning, by virtue of their cell or tissue source in the case of PCR-based techniques, or by virtue of structural similarity to other genes of known biological activity.

The bone marrow is a well-organized tissue located within the central cavity of bone. It
25 has a complex three-dimensional structure that is richly innervated and highly vascularized. Two primary cell types make up the structure of the bone marrow. These are the stromal, and parenchymal cells. Stromal cells include reticular cells such as fibroblasts, endothelial cells, adipocytes, as well as cells of the osteochondrogenic lineage. They exert important influences on osteoclastogenesis and lymphopoiesis, and have additional effects on bone turnover.
30 Parenchymal cells are comprised of the hematopoietic cells, and are important for proliferation, maturation, and migration of cells that make up the blood.

In the adult, hematopoiesis takes place primarily in the bone marrow. Therefore, all of the cells that make up the blood, such as erythrocytes, platelets, basophils, natural killer cells, eosinophils, T- and B-lymphocytes, neutrophils, macrophages, and others, are produced in this
35 structure. Each of these cells is derived from a common, self-renewing stem cell that

proliferates, and/or differentiates depending on regulatory molecules that are produced by the stromal cells. Stromal cells are predominantly a mixture of fibroblasts, macrophage/dendritic lineage cells, epithelial cells, and endothelial cells. They influence the fate of hematopoietic cells through the secretion of soluble factors, cytokines, and the expression of membrane-
5 anchored growth factors, and cell surface recognition molecules.

Cytokines are necessary for normal hematopoiesis in the bone marrow, and provide a means of fine-tuning bone marrow function in response to stimulation. They are not only produced by stromal cells, but can also be secreted by macrophages, and antigen-stimulated T lymphocytes for the purpose of replenishing leukocytes that may be consumed during immune
10 and inflammatory reactions. Many cytokines that influence the differentiation and expansion of hematopoietic progenitor cells are termed colony-stimulating factors, because they were initially assayed by their ability to stimulate the formation of cell colonies in bone marrow cultures. Some of these colony-stimulating factors (CSFs) include, granulocyte-CSF, granulocyte/macrophage-CSF, monocyte-CSF, Kit-ligand, interleukin (IL)-6, FLK-2 ligand, and
15 leukemia inhibitory factor. Each of these stimulates the growth and development of various leukocytic or erythroid colonies. Other cytokines secreted in the bone marrow include IL-9, a T cell line and mast cell progenitor-stimulating factor, IL-11, a megakaryocytopoiesis stimulator, and IL-7, a cytokine that influences the survival and expansion of immature precursors committed to the B and T cell lineages. Many other cytokines are also secreted in the bone
20 marrow.

Cell-surface molecules that represent several adhesion molecule superfamilies including integrins, selectins, sialomucins and the immunoglobulin domain-containing proteins, are important in supporting cell-cell and cell-extracellular matrix interactions in the bone marrow. These proteins are critical to the homing of progenitor cells selectively to the marrow stroma for
25 proliferation and differentiation. They also serve to influence the fate of the progenitor cells by directing them to differentiate into a specific lineage. For example, VLA-4 directs control of late erythroid differentiation and pro-B cell maturation.

The bone marrow is also the site of B cell development. B cells begin as lymphoid stem cells that differentiate into progenitor B-cells, or pro-B cells. Pro-B cells proliferate within the
30 bone marrow, and fill the extravascular spaces between large sinusoids in the shaft of the bone. They next mature into precursor B cells, pre-B cells. The stromal cells of the bone marrow are crucial for both pro- and pre-B cell development because they provide a source of cytokines, and a substrate for direct interaction with the pro- and pre-B cells. Pro-B cells require interaction with VCAM-1 and stem-cell factor (SCF) on the stromal cells to induce expression of the IL-7
35 receptor. Secretion of IL-7 by the stromal cells then induces the pro-B cells to mature into pre-B

cells. Continued IL-7 secretion by stromal cells induces pre-B cells to begin proliferating and eventually differentiates them into immature B-cells. In addition, a selection process within the bone marrow eliminates B cells with self-reactive phenotypes, functioning to protect against autoimmune disease.

5 The bone marrow environment also influences bone turnover and bone precursor cell functions. Bone marrow stromal cells include the precursors of the osteochondrogenic lineage, and can modulate the effects of some systemic factors on bone turnover. Furthermore, hematopoietic cells may influence the differentiation of osteogenic cells, and mature lymphocytes may impact osteoclastic and osteoblastic functions. For instance, B-lymphocytes
10 have been implicated in the secretion of factors that change the immunological milieu at sites of new bone induction and influence new bone formation.

 The identified bone marrow-expressed polynucleotide and polypeptide sequences may have applications in hematopoiesis, stem cell survival, and bone growth and remodeling. Identification of secreted factors that stimulate hematopoiesis may serve to produce greater
15 immune responses in immunosuppressed individuals. The identification of factors that preferentially stimulate specific hematopoietic cell types may also allow the prevention of specific disorders such as anemia in the case erythroid cell stimulating factors, or platelet deficiency in the case of megakaryocyte stimulating factors. Likewise, stem cell stimulating factors may be used to restore blood cell populations following chemotherapy treatments for
20 cancer. Therapy to stimulate bone healing and remodeling may also be identified by the discovery of novel factors in the bone marrow that influence bone resorption by osteoclasts, or new bone cell differentiation from stromal cells.

2. SUMMARY OF THE INVENTION

25 The compositions of the present invention include novel isolated polypeptides from bone marrow tissue, and novel isolated polynucleotides from bone marrow tissue encoding such polypeptides, including recombinant DNA molecules, cloned genes or degenerate variants thereof, especially naturally occurring variants such as allelic variants, antisense polynucleotide molecules, and antibodies that specifically recognize one or more epitopes present on such polypeptides, as
30 well as hybridomas producing such antibodies.

 The compositions of the present invention additionally include vectors, including expression vectors, containing the polynucleotides of the invention, cells genetically engineered to contain such polynucleotides and cells genetically engineered to express such polynucleotides.

 The present invention relates to a collection or library of at least one novel nucleic acid
35 sequence assembled from expressed sequence tags (ESTs) isolated mainly by sequencing by

hybridization (SBH), and in some cases, sequences obtained from one or more public databases.

The invention relates also to the proteins encoded by such polynucleotides, along with therapeutic, diagnostic and research utilities for these polynucleotides and proteins. These nucleic acid sequences are designated as SEQ ID NO: 1-87, 175-261 or 349-353 and are provided in the Sequence Listing. In the nucleic acids provided in the Sequence Listing, A is adenine; C is cytosine; G is guanosine; T is thymine; and N is any of the four bases. In the amino acids provided in the Sequence Listing, * corresponds to the stop codon.

The nucleic acid sequences of the present invention also include, nucleic acid sequences that hybridize to the complement of SEQ ID NO: 1-87, 175-261 or 349-353 under stringent hybridization conditions; nucleic acid sequences which are allelic variants or species homologues of any of the nucleic acid sequences recited above, or nucleic acid sequences that encode a peptide comprising a specific domain or truncation of the peptides encoded by SEQ ID NO: 1-87, 175-261 or 349-353. A polynucleotide comprising a nucleotide sequence having at least 90% identity to an identifying sequence of SEQ ID NO: 1-87, 175-261 or 349-353 or a degenerate variant or fragment thereof. The identifying sequence can be 100 base pairs in length.

The nucleic acid sequences of the present invention also include the sequence information from the nucleic acid sequences of SEQ ID NO: 1-87, 175-261 or 349-353. The sequence information can be a segment of any one of SEQ ID NO: 1-87, 175-261 or 349-353 that uniquely identifies or represents the sequence information of SEQ ID NO: 1-87, 175-261 or 349-353.

A collection as used in this application can be a collection of only one polynucleotide. The collection of sequence information or identifying information of each sequence can be provided on a nucleic acid array. In one embodiment, segments of sequence information are provided on a nucleic acid array to detect the polynucleotide that contains the segment. The array can be designed to detect full-match or mismatch to the polynucleotide that contains the segment. The collection can also be provided in a computer-readable format.

This invention also includes the reverse or direct complement of any of the nucleic acid sequences recited above; cloning or expression vectors containing the nucleic acid sequences; and host cells or organisms transformed with these expression vectors. Nucleic acid sequences (or their reverse or direct complements) according to the invention have numerous applications in a variety of techniques known to those skilled in the art of molecular biology, such as use as hybridization probes, use as primers for PCR, use in an array, use in computer-readable media, use in sequencing full-length genes, use for chromosome and gene mapping, use in the recombinant production of protein, and use in the generation of anti-sense DNA or RNA, their chemical analogs and the like.

In a preferred embodiment, the nucleic acid sequences of SEQ ID NO: 1-87, 175-261 or 349-353, or novel segments or parts of the nucleic acids of the invention are used as primers in

expression assays that are well known in the art. In a particularly preferred embodiment, the nucleic acid sequences of SEQ ID NO: 1-87, 175-261 or 349-353 or novel segments or parts of the nucleic acids provided herein are used in diagnostics for identifying bone marrow tissues and cells; for identifying expressed genes or, as well known in the art and exemplified by Vollrath et al., Science 5 258:52-59 (1992), as expressed sequence tags for physical mapping of the human genome.

The isolated polynucleotides of the invention include, but are not limited to, a polynucleotide comprising any one of the nucleotide sequences set forth in SEQ ID NO: 1-87, 175-261 or 349-353; a polynucleotide comprising any of the full length protein coding sequences of SEQ ID NO: 1-87, 175-261 or 349-353; and a polynucleotide comprising any of the nucleotide 10 sequences of the mature protein coding sequences of SEQ ID NO: 1-87, 175-261 or 349-353. The polynucleotides of the present invention also include, but are not limited to, a polynucleotide that hybridizes under stringent hybridization conditions to (a) the complement of any one of the nucleotide sequences set forth in SEQ ID NO: 1-87, 175-261 or 349-353; (b) a nucleotide sequence encoding any one of the amino acid sequences comprising 88 – 174, 262-348 or 354-358 as set 15 forth in the Sequence Listing; (c) a polynucleotide which is an allelic variant of any polynucleotides recited above; (d) a polynucleotide which encodes a species homolog (e.g. orthologs) of any of the proteins recited above; or (e) a polynucleotide that encodes a polypeptide comprising a specific domain or truncation of any of the polypeptides comprising an amino acid sequence set forth in the Sequence Listing.

20 The isolated polypeptides of the invention include, but are not limited to, a polypeptide comprising any of the amino acid sequences set forth in the Sequence Listing; or the corresponding full length or mature protein. Polypeptides of the invention also include polypeptides with biological activity that are encoded by (a) any of the polynucleotides having a nucleotide sequence set forth in SEQ ID NO: 1-87, 175-261 or 349-353; or (b) polynucleotides that hybridize to the 25 complement of the polynucleotides of (a) under stringent hybridization conditions, or (c) polypeptides comprising any of the polypeptide sequences set forth in SEQ ID NO: 88-174, 262-348 or 354-358. Biologically or immunologically active variants of any of the polypeptide sequences in the Sequence Listing, and “substantial equivalents” thereof (e.g., with at least about 65%, 70%, 75%, 80%, 85%, 90%, 95%, 98% or 99% amino acid sequence identity) that preferably 30 retain biological activity are also contemplated. The polypeptides of the invention may be wholly or partially chemically synthesized but are preferably produced by recombinant means using the genetically engineered cells (e.g. host cells) of the invention. The polypeptides may have the initial methionine (Met) removed.

The invention also provides compositions comprising a polypeptide of the invention. Polypeptide compositions of the invention may further comprise an acceptable carrier, such as a hydrophilic, e.g., pharmaceutically acceptable, carrier.

5 The invention also provides host cells transformed or transfected with a polynucleotide of the invention.

The invention also relates to methods for producing a polypeptide of the invention comprising growing a culture of the host cells of the invention in a suitable culture medium under conditions permitting expression of the desired polypeptide, and purifying the polypeptide from the culture or from the host cells. Preferred embodiments include those in which the
10 protein produced by such process is a mature form of the protein.

Polynucleotides according to the invention have numerous applications in a variety of techniques known to those skilled in the art of molecular biology. These techniques include use as hybridization probes, use as oligomers, or primers, for PCR, use for chromosome and gene mapping, use in the recombinant production of protein, and use in generation of anti-sense DNA
15 or RNA, their chemical analogs and the like. For example, when the expression of an mRNA is largely restricted to a particular cell or tissue type, polynucleotides of the invention can be used as hybridization probes to detect the presence of the particular cell or tissue mRNA in a sample using, e.g., *in situ* hybridization.

In other exemplary embodiments, the polynucleotides are used in diagnostics as
20 expressed sequence tags for identifying expressed genes or, as well known in the art and exemplified by Vollrath et al., Science 258:52-59 (1992), as expressed sequence tags for physical mapping of the human genome.

The polypeptides according to the invention can be used in a variety of conventional procedures and methods that are currently applied to other proteins. For example, a polypeptide
25 of the invention can be used to generate an antibody that specifically binds the polypeptide. Such antibodies, particularly monoclonal antibodies, are useful for detecting or quantitating the polypeptide in tissue. The polypeptides of the invention can also be used as molecular weight markers, and as a food supplement.

Methods are also provided for preventing, treating, or ameliorating a medical condition
30 which comprises the step of administering to a mammalian subject a therapeutically effective amount of a composition comprising a polypeptide of the present invention and a pharmaceutically acceptable carrier.

In particular, the polypeptides and polynucleotides of the invention can be utilized, for example, in methods for the prevention and/or treatment of disorders involving aberrant protein
35 expression or biological activity.

The present invention further relates to methods for detecting the presence of the polynucleotides or polypeptides of the invention in a sample. Such methods can, for example, be utilized as part of prognostic and diagnostic evaluation of disorders as recited herein and for the identification of subjects exhibiting a predisposition to such conditions. The invention provides

5 a method for detecting the polynucleotides of the invention in a sample, comprising contacting the sample with a compound that binds to and forms a complex with the polynucleotide of interest for a period sufficient to form the complex and under conditions sufficient to form a complex and detecting the complex such that if a complex is detected, the polynucleotide of interest is detected. The invention also provides a method for detecting the polypeptides of the

10 invention in a sample comprising contacting the sample with a compound that binds to and forms a complex with the polypeptide under conditions and for a period sufficient to form the complex and detecting the formation of the complex such that if a complex is formed, the polypeptide is detected.

The invention also provides kits comprising polynucleotide probes and/or monoclonal

15 antibodies, and optionally quantitative standards, for carrying out methods of the invention. Furthermore, the invention provides methods for evaluating the efficacy of drugs, and monitoring the progress of patients, involved in clinical trials for the treatment of disorders as recited above.

The invention also provides methods for the identification of compounds that modulate

20 (i.e., increase or decrease) the expression or activity of the polynucleotides and/or polypeptides of the invention. Such methods can be utilized, for example, for the identification of compounds that can ameliorate symptoms of disorders as recited herein. Such methods can include, but are not limited to, assays for identifying compounds and other substances that interact with (e.g., bind to) the polypeptides of the invention. The invention provides a method for identifying a

25 compound that binds to the polypeptides of the invention comprising contacting the compound with a polypeptide of the invention in a cell for a time sufficient to form a polypeptide/compound complex, wherein the complex drives expression of a reporter gene sequence in the cell; and detecting the complex by detecting the reporter gene sequence expression such that if expression of the reporter gene is detected the compound the binds to a

30 polypeptide of the invention is identified.

The methods of the invention also provide methods for treatment that involve the administration of the polynucleotides or polypeptides of the invention to individuals exhibiting symptoms or tendencies. In addition, the invention encompasses methods for treating diseases or disorders as recited herein comprising administering compounds and other substances that

35 modulate the overall activity of the target gene products. Compounds and other substances can

affect such modulation either on the level of target gene/protein expression or target protein activity.

The polypeptides of the present invention and the polynucleotides encoding them are also useful for the same functions known to one of skill in the art as the polypeptides and polynucleotides to which they have homology (set forth in Tables 1A-D and 7); for which they have a signature region (as set forth in Table 2 and 8); or for which they have homology to a gene family (as set forth in Table 3). If no homology is set forth for a sequence, then the polypeptides and polynucleotides of the present invention are useful for a variety of applications, as described herein, including use in increasing hematopoiesis, stem cell survival, and bone growth and remodeling.

3. DETAILED DESCRIPTION OF THE INVENTION

3.1 DEFINITIONS

It must be noted that as used herein and in the appended claims, the singular forms "a", "an" and "the" include plural references unless the context clearly dictates otherwise.

The term "active" refers to those forms of the polypeptide that retain the biologic and/or immunologic activities of any naturally occurring polypeptide. According to the invention, the terms "biologically active" or "biological activity" refer to a protein or peptide having structural, regulatory or biochemical functions of a naturally occurring molecule. Likewise "immunologically active" or "immunological activity" refers to the capability of the natural, recombinant or synthetic polypeptide to induce a specific immune response in appropriate animals or cells and to bind with specific antibodies.

The term "activated cells" as used in this application are those cells which are engaged in extracellular or intracellular membrane trafficking, including the export of secretory or enzymatic molecules as part of a normal or disease process.

The terms "complementary" or "complementarity" refer to the natural binding of polynucleotides by base pairing. For example, the sequence 5'-AGT-3' binds to the complementary sequence 3'-TCA-5'. Complementarity between two single-stranded molecules may be "partial" such that only some of the nucleic acids bind or it may be "complete" such that total complementarity exists between the single stranded molecules. The degree of complementarity between the nucleic acid strands has significant effects on the efficiency and strength of the hybridization between the nucleic acid strands.

The term "embryonic stem cells (ES)" refers to a cell that can give rise to many differentiated cell types in an embryo or an adult, including the germ cells. The term "germ line

stem cells (GSCs)" refers to stem cells derived from primordial stem cells that provide a steady and continuous source of germ cells for the production of gametes. The term "primordial germ cells (PGCs)" refers to a small population of cells set aside from other cell lineages particularly from the yolk sac, mesenteries, or gonadal ridges during embryogenesis that have the potential to differentiate into germ cells and other cells. PGCs are the source from which GSCs and ES cells are derived. The PGCs, the GSCs and the ES cells are capable of self-renewal. Thus these cells not only populate the germ line and give rise to a plurality of terminally differentiated cells that comprise the adult specialized organs, but are able to regenerate themselves.

The term "expression modulating fragment," EMF, means a series of nucleotides that modulates the expression of an operably linked ORF or another EMF.

As used herein, a sequence is said to "modulate the expression of an operably linked sequence" when the expression of the sequence is altered by the presence of the EMF. EMFs include, but are not limited to, promoters, and promoter modulating sequences (inducible elements). One class of EMFs is nucleic acid fragments that induce the expression of an operably linked ORF in response to a specific regulatory factor or physiological event.

The terms "nucleotide sequence" or "nucleic acid" or "polynucleotide" or "oligonucleotide" are used interchangeably and refer to a heteropolymer of nucleotides or the sequence of these nucleotides. These phrases also refer to DNA or RNA of genomic or synthetic origin which may be single-stranded or double-stranded and may represent the sense or the antisense strand, to peptide nucleic acid (PNA) or to any DNA-like or RNA-like material. It is contemplated that where the polynucleotide is RNA, the T (thymine) in the sequences provided herein is substituted with U (uracil). Generally, nucleic acid segments provided by this invention may be assembled from fragments of the genome and short oligonucleotide linkers, or from a series of oligonucleotides, or from individual nucleotides, to provide a synthetic nucleic acid which is capable of being expressed in a recombinant transcriptional unit comprising regulatory elements derived from a microbial or viral operon, or a eukaryotic gene.

The terms "oligonucleotide fragment" or a "polynucleotide fragment", "portion," or "segment" or "probe" or "primer" are used interchangeably and refer to a sequence of nucleotide residues which are at least about 5 nucleotides, more preferably at least about 7 nucleotides, more preferably at least about 9 nucleotides, more preferably at least about 11 nucleotides and most preferably at least about 17 nucleotides. The fragment is preferably less than about 500 nucleotides, preferably less than about 200 nucleotides, more preferably less than about 100 nucleotides, more preferably less than about 50 nucleotides and most preferably less than 30 nucleotides. Preferably the probe is from about 6 nucleotides to about 200 nucleotides, preferably from about 15 to about 50 nucleotides, more preferably from about 17 to 30

nucleotides and most preferably from about 20 to 25 nucleotides. Preferably the fragments can be used in polymerase chain reaction (PCR), various hybridization procedures or microarray procedures to identify or amplify identical or related parts of mRNA or DNA molecules. A fragment or segment may uniquely identify each polynucleotide sequence of the present invention. Preferably the fragment comprises a sequence substantially similar to any one of SEQ ID NOs: 1-87, 175-261 or 349-353.

Probes may, for example, be used to determine whether specific mRNA molecules are present in a cell or tissue or to isolate similar nucleic acid sequences from chromosomal DNA as described by Walsh et al. (Walsh, P.S. et al., 1992, PCR Methods Appl 1:241-250). They may be labeled by nick translation, Klenow fill-in reaction, PCR, or other methods well known in the art. Probes of the present invention, their preparation and/or labeling are elaborated in Sambrook, J. et al., 1989, Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, NY; or Ausubel, F.M. et al., 1989, Current Protocols in Molecular Biology, John Wiley & Sons, New York NY, both of which are incorporated herein by reference in their entirety.

The nucleic acid sequences of the present invention also include the sequence information from the nucleic acid sequences of SEQ ID NOs: 1-87, 175-261 or 349-353. The sequence information can be a segment of any one of SEQ ID NOs: 1-87, 175-261 or 349-353 that uniquely identifies or represents the sequence information of that sequence of SEQ ID NO: 1-87, 175-261 or 349-353. One such segment can be a twenty-mer nucleic acid sequence because the probability that a twenty-mer is fully matched in the human genome is 1 in 300. In the human genome, there are three billion base pairs in one set of chromosomes. Because 4^{20} possible twenty-mers exist, there are 300 times more twenty-mers than there are base pairs in a set of human chromosome. Using the same analysis, the probability for a seventeen-mer to be fully matched in the human genome is approximately 1 in 5. When these segments are used in arrays for expression studies, fifteen-mer segments can be used. The probability that the fifteen-mer is fully matched in the expressed sequences is also approximately one in five because expressed sequences comprise less than approximately 5% of the entire genome sequence.

Similarly, when using sequence information for detecting a single mismatch, a segment can be a twenty-five mer. The probability that the twenty-five mer would appear in a human genome with a single mismatch is calculated by multiplying the probability for a full match ($1/4^{25}$) times the increased probability for mismatch at each nucleotide position (3×25). The probability that an eighteen mer with a single mismatch can be detected in an array for expression studies is approximately one in five. The probability that a twenty-mer with a single mismatch can be detected in a human genome is approximately one in five.

The term "open reading frame," ORF, means a series of nucleotide triplets coding for amino acids without any termination codons and is a sequence translatable into protein.

The terms "operably linked" or "operably associated" refer to functionally related nucleic acid sequences. For example, a promoter is operably associated or operably linked with a coding sequence if the promoter controls the transcription of the coding sequence. While operably linked nucleic acid sequences can be contiguous and in the same reading frame, certain genetic elements e.g. repressor genes are not contiguously linked to the coding sequence but still control transcription/translation of the coding sequence.

The term "pluripotent" refers to the capability of a cell to differentiate into a number of differentiated cell types that are present in an adult organism. A pluripotent cell is restricted in its differentiation capability in comparison to a totipotent cell.

The terms "polypeptide" or "peptide" or "amino acid sequence" refer to an oligopeptide, peptide, polypeptide or protein sequence or fragment thereof and to naturally occurring or synthetic molecules. A polypeptide "fragment," "portion," or "segment" is a stretch of amino acid residues of at least about 5 amino acids, preferably at least about 7 amino acids, more preferably at least about 9 amino acids and most preferably at least about 17 or more amino acids. The peptide preferably is not greater than about 200 amino acids, more preferably less than 150 amino acids and most preferably less than 100 amino acids. Preferably the peptide is from about 5 to about 200 amino acids. To be active, any polypeptide must have sufficient length to display biological and/or immunological activity.

The term "naturally occurring polypeptide" refers to polypeptides produced by cells that have not been genetically engineered and specifically contemplates various polypeptides arising from post-translational modifications of the polypeptide including, but not limited to, acetylation, carboxylation, glycosylation, phosphorylation, lipidation and acylation.

The term "translated protein coding portion" means a sequence that encodes for the full-length protein which may include any leader sequence or any processing sequence.

The term "mature protein coding sequence" means a sequence that encodes a peptide or protein without a signal or leader sequence. The "mature protein portion" means that portion of the protein which does not include a signal or leader sequence. The peptide may have been produced by processing in the cell that removes any leader/signal sequence. The mature protein portion may or may not include an initial methionine residue. The methionine residue may be removed from the protein during processing in the cell. The peptide may be produced synthetically or the protein may have been produced using a polynucleotide only encoding for the mature protein coding sequence.

The term "derivative" refers to polypeptides chemically modified by such techniques as ubiquitination, labeling (e.g., with radionuclides or various enzymes), covalent polymer attachment such as pegylation (derivatization with polyethylene glycol) and insertion or substitution by chemical synthesis of amino acids such as ornithine, which do not normally occur in human proteins.

The term "variant" (or "analog") refers to any polypeptide differing from naturally occurring polypeptides by amino acid insertions, deletions, and substitutions, created using, *e.g.*, recombinant DNA techniques. Guidance in determining which amino acid residues may be replaced, added or deleted without abolishing activities of interest, may be found by comparing the sequence of the particular polypeptide with that of homologous peptides and minimizing the number of amino acid sequence changes made in regions of high homology (conserved regions) or by replacing amino acids with consensus sequence.

Alternatively, recombinant variants encoding these same or similar polypeptides may be synthesized or selected by making use of the "redundancy" in the genetic code. Various codon substitutions, such as the silent changes that produce various restriction sites, may be introduced to optimize cloning into a plasmid or viral vector or expression in a particular prokaryotic or eukaryotic system. Mutations in the polynucleotide sequence may be reflected in the polypeptide or domains of other peptides added to the polypeptide to modify the properties of any part of the polypeptide, to change characteristics such as ligand-binding affinities, interchain affinities, or degradation/turnover rate.

Preferably, amino acid "substitutions" are the result of replacing one amino acid with another amino acid having similar structural and/or chemical properties, *i.e.*, conservative amino acid replacements. "Conservative" amino acid substitutions may be made on the basis of similarity in polarity, charge, solubility, hydrophobicity, hydrophilicity, and/or the amphipathic nature of the residues involved. For example, nonpolar (hydrophobic) amino acids include alanine, leucine, isoleucine, valine, proline, phenylalanine, tryptophan, and methionine; polar neutral amino acids include glycine, serine, threonine, cysteine, tyrosine, asparagine, and glutamine; positively charged (basic) amino acids include arginine, lysine, and histidine; and negatively charged (acidic) amino acids include aspartic acid and glutamic acid. "Insertions" or "deletions" are preferably in the range of about 1 to 20 amino acids, more preferably 1 to 10 amino acids. The variation allowed may be experimentally determined by systematically making insertions, deletions, or substitutions of amino acids in a polypeptide molecule using recombinant DNA techniques and assaying the resulting recombinant variants for activity.

Alternatively, where alteration of function is desired, insertions, deletions or non-conservative alterations can be engineered to produce altered polypeptides. Such alterations

can, for example, alter one or more of the biological functions or biochemical characteristics of the polypeptides of the invention. For example, such alterations may change polypeptide characteristics such as ligand-binding affinities, interchain affinities, or degradation/turnover rate. Further, such alterations can be selected so as to generate polypeptides that are better suited
5 for expression, scale up and the like in the host cells chosen for expression. For example, cysteine residues can be deleted or substituted with another amino acid residue in order to eliminate disulfide bridges.

The terms "purified" or "substantially purified" as used herein denotes that the indicated nucleic acid or polypeptide is present in the substantial absence of other biological
10 macromolecules, *e.g.*, polynucleotides, proteins, and the like. In one embodiment, the polynucleotide or polypeptide is purified such that it constitutes at least 95% by weight, more preferably at least 99% by weight, of the indicated biological macromolecules present (but water, buffers, and other small molecules, especially molecules having a molecular weight of less than 1000 Daltons, can be present).

The term "isolated" as used herein refers to a nucleic acid or polypeptide separated from at least one other component (*e.g.*, nucleic acid or polypeptide) present with the nucleic acid or polypeptide in its natural source. In one embodiment, the nucleic acid or polypeptide is found in the presence of (if anything) only a solvent, buffer, ion, or other component normally present in a solution of the same. The terms "isolated" and "purified" do not encompass nucleic acids or
15 polypeptides present in their natural source.

The term "recombinant," when used herein to refer to a polypeptide or protein, means that a polypeptide or protein is derived from recombinant (*e.g.*, microbial, insect, or mammalian) expression systems. "Microbial" refers to recombinant polypeptides or proteins made in bacterial or fungal (*e.g.*, yeast) expression systems. As a product, "recombinant microbial"
25 defines a polypeptide or protein essentially free of native endogenous substances and unaccompanied by associated native glycosylation. Polypeptides or proteins expressed in most bacterial cultures, *e.g.*, *E. coli*, will be free of glycosylation modifications; polypeptides or proteins expressed in yeast will have a glycosylation pattern in general different from those expressed in mammalian cells.

The term "recombinant expression vehicle or vector" refers to a plasmid or phage or virus or vector, for expressing a polypeptide from a DNA (RNA) sequence. An expression vehicle can comprise a transcriptional unit comprising an assembly of (1) a genetic element or elements having a regulatory role in gene expression, for example, promoters or enhancers, (2) a structural or coding sequence which is transcribed into mRNA and translated into protein, and (3)
35 appropriate transcription initiation and termination sequences. Structural units intended for use

in yeast or eukaryotic expression systems preferably include a leader sequence enabling extracellular secretion of translated protein by a host cell. Alternatively, where recombinant protein is expressed without a leader or transport sequence, it may include an amino terminal methionine residue. This residue may or may not be subsequently cleaved from the expressed recombinant protein to provide a final product.

The term "recombinant expression system" means host cells that have stably integrated a recombinant transcriptional unit into chromosomal DNA or carry the recombinant transcriptional unit extrachromosomally. Recombinant expression systems as defined herein will express heterologous polypeptides or proteins upon induction of the regulatory elements linked to the DNA segment or synthetic gene to be expressed. This term also means host cells that have stably integrated a recombinant genetic element or elements having a regulatory role in gene expression, for example, promoters or enhancers. Recombinant expression systems as defined herein will express polypeptides or proteins endogenous to the cell upon induction of the regulatory elements linked to the endogenous DNA segment or gene to be expressed. The cells can be prokaryotic or eukaryotic.

The term "secreted" includes a protein that is transported across or through a membrane, including transport as a result of signal sequences in its amino acid sequence when it is expressed in a suitable host cell. "Secreted" proteins include without limitation proteins secreted wholly (*e.g.*, soluble proteins) or partially (*e.g.*, receptors) from the cell in which they are expressed. "Secreted" proteins also include without limitation proteins that are transported across the membrane of the endoplasmic reticulum. "Secreted" proteins are also intended to include proteins containing non-typical signal sequences (*e.g.* Interleukin-1 Beta, see Krasney, P.A. and Young, P.R. (1992) Cytokine 4(2):134 -143) and factors released from damaged cells (*e.g.* Interleukin-1 Receptor Antagonist, see Arend, W.P. et. al. (1998) Annu. Rev. Immunol. 16:27-55)

Where desired, an expression vector may be designed to contain a "signal or leader sequence" which will direct the polypeptide through the membrane of a cell. Such a sequence may be naturally present on the polypeptides of the present invention or provided from heterologous protein sources by recombinant DNA techniques.

The term "stringent" is used to refer to conditions that are commonly understood in the art as stringent. Stringent conditions can include highly stringent conditions (*i.e.*, hybridization to filter-bound DNA in 0.5 M NaHPO₄, 7% sodium dodecyl sulfate (SDS), 1 mM EDTA at 65°C, and washing in 0.1X SSC/0.1% SDS at 68°C), and moderately stringent conditions (*i.e.*, washing in 0.2X SSC/0.1% SDS at 42°C). Other exemplary hybridization conditions are described herein in the examples.

In instances of hybridization of deoxyoligonucleotides, additional exemplary stringent hybridization conditions include washing in 6X SSC/0.05% sodium pyrophosphate at 37°C (for 14-base oligonucleotides), 48°C (for 17-base oligos), 55°C (for 20-base oligonucleotides), and 60°C (for 23-base oligonucleotides).

5 As used herein, "substantially equivalent" or "substantially similar" can refer both to nucleotide and amino acid sequences, for example a mutant sequence, that varies from a reference sequence by one or more substitutions, deletions, or additions, the net effect of which does not result in an adverse functional dissimilarity between the reference and subject sequences. Typically, such a substantially equivalent sequence varies from one of those listed
10 herein by no more than about 35% (*i.e.*, the number of individual residue substitutions, additions, and/or deletions in a substantially equivalent sequence, as compared to the corresponding reference sequence, divided by the total number of residues in the substantially equivalent sequence is about 0.35 or less). Such a sequence is said to have 65% sequence identity to the listed sequence. In one embodiment, a substantially equivalent, *e.g.*, mutant, sequence of the
15 invention varies from a listed sequence by no more than 30% (70% sequence identity); in a variation of this embodiment, by no more than 25% (75% sequence identity); and in a further variation of this embodiment, by no more than 20% (80% sequence identity) and in a further variation of this embodiment, by no more than 10% (90% sequence identity) and in a further variation of this embodiment, by no more than 5% (95% sequence identity). Substantially
20 equivalent, *e.g.*, mutant, amino acid sequences according to the invention preferably have at least 80% sequence identity with a listed amino acid sequence, more preferably at least 85% sequence identity, more preferably at least 90% sequence identity, more preferably at least 95% sequence identity, more preferably at least 98% sequence identity, and most preferably at least 99% sequence identity. Substantially equivalent nucleotide sequence of the invention can have lower
25 percent sequence identities, taking into account, for example, the redundancy or degeneracy of the genetic code. Preferably, the nucleotide sequence has at least about 65% identity, more preferably at least about 75% identity, more preferably at least about 80% sequence identity, more preferably at least 85% sequence identity, more preferably at least 90%, sequence identity, more preferably at least 95% sequence identity, more preferably at least 98% sequence identity,
30 and most preferably at least 99% sequence identity. For the purposes of the present invention, sequences having substantially equivalent biological activity and substantially equivalent expression characteristics are considered substantially equivalent. For the purposes of determining equivalence, truncation of the mature sequence (*e.g.*, via a mutation which creates a spurious stop codon) should be disregarded. Sequence identity may be determined, *e.g.*, using
35 the Jotun Hein method (Hein, J. (1990) *Methods Enzymol.* 183:626-645). Identity between

sequences can also be determined by other methods known in the art, e.g. by varying hybridization conditions.

The term "totipotent" refers to the capability of a cell to differentiate into all of the cell types of an adult organism.

5 The term "transformation" means introducing DNA into a suitable host cell so that the DNA is replicable, either as an extrachromosomal element, or by chromosomal integration. The term "transfection" refers to the taking up of an expression vector by a suitable host cell, whether or not any coding sequences are in fact expressed. The term "infection" refers to the introduction of nucleic acids into a suitable host cell by use of a virus or viral vector.

10 As used herein, an "uptake modulating fragment," UMF, means a series of nucleotides that mediate the uptake of a linked DNA fragment into a cell. UMFs can be readily identified using known UMFs as a target sequence or target motif with the computer-based systems described below. The presence and activity of a UMF can be confirmed by attaching the suspected UMF to a marker sequence. The resulting nucleic acid molecule is then incubated
15 with an appropriate host under appropriate conditions and the uptake of the marker sequence is determined. As described above, a UMF will increase the frequency of uptake of a linked marker sequence.

Each of the above terms is meant to encompass all that is described for each, unless the context dictates otherwise.

20

3.2 NUCLEIC ACIDS OF THE INVENTION

Nucleotide sequences of the invention are set forth in the Sequence Listing.

The isolated polynucleotides of the invention include a polynucleotide comprising the nucleotide sequences of SEQ ID NO: 1-87, 175-261 or 349-353; a polynucleotide encoding any
25 one of the peptide sequences of SEQ ID NO: 88-174, 262-348 or 354-358; and a polynucleotide comprising the nucleotide sequence encoding the mature protein coding sequence of the polynucleotides of any one of SEQ ID NO: 1-87, 175-261 or 349-353. The polynucleotides of the present invention also include, but are not limited to, a polynucleotide that hybridizes under stringent conditions to (a) the complement of any of the nucleotides sequences of SEQ ID NO:
30 1-87, 175-261 or 349-353; (b) nucleotide sequences encoding any one of the amino acid sequences set forth in the Sequence Listing; (c) a polynucleotide which is an allelic variant of any polynucleotide recited above; (d) a polynucleotide which encodes a species homolog of any of the proteins recited above; or (e) a polynucleotide that encodes a polypeptide comprising a specific domain or truncation of the polypeptides of SEQ ID NO: 88-174, 262-348 or 354-358.
35 Domains of interest may depend on the nature of the encoded polypeptide; e.g., domains in

receptor-like polypeptides include ligand-binding, extracellular, transmembrane, or cytoplasmic domains, or combinations thereof; domains in immunoglobulin-like proteins include the variable immunoglobulin-like domains; domains in enzyme-like polypeptides include catalytic and substrate binding domains; and domains in ligand polypeptides include receptor-binding domains.

The polynucleotides of the invention include naturally occurring or wholly or partially synthetic DNA, e.g., cDNA and genomic DNA, and RNA, e.g., mRNA. The polynucleotides may include all of the coding region of the cDNA or may represent a portion of the coding region of the cDNA.

The present invention also provides genes corresponding to the cDNA sequences disclosed herein. The corresponding genes can be isolated in accordance with known methods using the sequence information disclosed herein. Such methods include the preparation of probes or primers from the disclosed sequence information for identification and/or amplification of genes in appropriate genomic libraries or other sources of genomic materials. Further 5' and 3' sequence can be obtained using methods known in the art. For example, full length cDNA or genomic DNA that corresponds to any of the polynucleotides of SEQ ID NO: 1-87, 175-261 or 349-353 can be obtained by screening appropriate cDNA or genomic DNA libraries under suitable hybridization conditions using any of the polynucleotides of SEQ ID NO: 1-87, 175-261 or 349-353 or a portion thereof as a probe. Alternatively, the polynucleotides of SEQ ID NO: 1-87, 175-261 or 349-353 may be used as the basis for suitable primer(s) that allow identification and/or amplification of genes in appropriate genomic DNA or cDNA libraries.

The nucleic acid sequences of the invention can be assembled from ESTs and sequences (including cDNA and genomic sequences) obtained from one or more public databases, such as dbEST, gbpri, and UniGene. The EST sequences can provide identifying sequence information, representative fragment or segment information, or novel segment information for the full-length gene.

The polynucleotides of the invention also provide polynucleotides including nucleotide sequences that are substantially equivalent to the polynucleotides recited above. Polynucleotides according to the invention can have, e.g., at least about 65%, at least about 70%, at least about 75%, at least about 80%, 81%, 82%, 83%, 84%, more typically at least about 85%, 86%, 87%, 88%, 89%, more typically at least about 90%, 91%, 92%, 93%, 94%, and even more typically at least about 95%, 96%, 97%, 98%, 99% sequence identity to a polynucleotide recited above.

Included within the scope of the nucleic acid sequences of the invention are nucleic acid sequence fragments that hybridize under stringent conditions to any of the nucleotide sequences of SEQ ID NO: 1-87, 175-261 or 349-353 or complements thereof, which fragment is greater

than about 5 nucleotides, preferably 7 nucleotides, more preferably greater than 9 nucleotides and most preferably greater than 17 nucleotides. Fragments of, e.g. 15, 17, or 20 nucleotides or more that are selective for (i.e. specifically hybridize to any one of the polynucleotides of the invention) are contemplated. Probes capable of specifically hybridizing to a polynucleotide can
5 differentiate polynucleotide sequences of the invention from other polynucleotide sequences in the same family of genes or can differentiate human genes from genes of other species, and are preferably based on unique nucleotide sequences.

The sequences falling within the scope of the present invention are not limited to these specific sequences, but also include allelic and species variations thereof. Allelic and species
10 variations can be routinely determined by comparing the sequence provided in SEQ ID NO: 1-87, 175-261 or 349-353, a representative fragment thereof, or a nucleotide sequence at least 90% identical, preferably 95% identical, to SEQ ID NOs: 1-87, 175-261 or 349-353 with a sequence from another isolate of the same species. Furthermore, to accommodate codon variability, the invention includes nucleic acid molecules coding for the same amino acid sequences as do the
15 specific ORFs disclosed herein. In other words, in the coding region of an ORF, substitution of one codon for another codon that encodes the same amino acid is expressly contemplated.

The nearest neighbor or homology result for the nucleic acids of the present invention, including SEQ ID NOs: 1-87, 175-261 or 349-353, can be obtained by searching a database using an algorithm or a program. Preferably, a BLAST, which stands for Basic Local Alignment Search
20 Tool, is used to search for local sequence alignments (Altschul, S.F. J Mol. Evol. 36 290-300 (1993) and Altschul S.F. et al. J. Mol. Biol. 21:403-410 (1990)). Alternatively a FASTA version 3 search against Genpept, using Fastxy algorithm could also be used.

Species homologs (or orthologs) of the disclosed polynucleotides and proteins are also provided by the present invention. Species homologs may be isolated and identified by making
25 suitable probes or primers from the sequences provided herein and screening a suitable nucleic acid source from the desired species.

The invention also encompasses allelic variants of the disclosed polynucleotides or proteins; that is, naturally-occurring alternative forms of the isolated polynucleotide which also encode proteins which are identical, homologous or related to that encoded by the
30 polynucleotides.

The nucleic acid sequences of the invention are further directed to sequences that encode variants of the described nucleic acids. These amino acid sequence variants may be prepared by methods known in the art by introducing appropriate nucleotide changes into a native or variant polynucleotide. There are two variables in the construction of amino acid sequence variants: the
35 location of the mutation and the nature of the mutation. Nucleic acids encoding the amino acid

sequence variants are preferably constructed by mutating the polynucleotide to encode an amino acid sequence that does not occur in nature. These nucleic acid alterations can be made at sites that differ in the nucleic acids from different species (variable positions) or in highly conserved regions (constant regions). Sites at such locations will typically be modified in series, *e.g.*, by substituting first with conservative choices (*e.g.*, hydrophobic amino acid to a different hydrophobic amino acid) and then with more distant choices (*e.g.*, hydrophobic amino acid to a charged amino acid), and then deletions or insertions may be made at the target site. Amino acid sequence deletions generally range from about 1 to 30 residues, preferably about 1 to 10 residues, and are typically contiguous. Amino acid insertions include amino- and/or carboxyl-terminal fusions ranging in length from one to one hundred or more residues, as well as intrasequence insertions of single or multiple amino acid residues. Intrasequence insertions may range generally from about 1 to 10 amino residues, preferably from 1 to 5 residues. Examples of terminal insertions include the heterologous signal sequences necessary for secretion or for intracellular targeting in different host cells and sequences such as FLAG or poly-histidine sequences useful for purifying the expressed protein.

In a preferred method, polynucleotides encoding the novel amino acid sequences are changed via site-directed mutagenesis. This method uses oligonucleotide sequences to alter a polynucleotide to encode the desired amino acid variant, as well as sufficient adjacent nucleotides on both sides of the changed amino acid to form a stable duplex on either side of the site of being changed. In general, the techniques of site-directed mutagenesis are well known to those of skill in the art and this technique is exemplified by publications such as, Edelman et al., *DNA* 2:183 (1983). A versatile and efficient method for producing site-specific changes in a polynucleotide sequence was published by Zoller and Smith, *Nucleic Acids Res.* 10:6487-6500 (1982). PCR may also be used to create amino acid sequence variants of the novel nucleic acids. When small amounts of template DNA are used as starting material, primer(s) that differs slightly in sequence from the corresponding region in the template DNA can generate the desired amino acid variant. PCR amplification results in a population of product DNA fragments that differ from the polynucleotide template encoding the polypeptide at the position specified by the primer. The product DNA fragments replace the corresponding region in the plasmid and this gives a polynucleotide encoding the desired amino acid variant.

A further technique for generating amino acid variants is the cassette mutagenesis technique described in Wells et al., *Gene* 34:315 (1985); and other mutagenesis techniques well known in the art, such as, for example, the techniques in Sambrook et al., *supra*, and *Current Protocols in Molecular Biology*, Ausubel et al. Due to the inherent degeneracy of the genetic code, other DNA sequences which encode substantially the same or a functionally equivalent

amino acid sequence may be used in the practice of the invention for the cloning and expression of these novel nucleic acids. Such DNA sequences include those that are capable of hybridizing to the appropriate novel nucleic acid sequence under stringent conditions.

Polynucleotides encoding preferred polypeptide truncations of the invention can be used to generate polynucleotides encoding chimeric or fusion proteins comprising one or more domains of the invention and heterologous protein sequences.

The polynucleotides of the invention additionally include the complement of any of the polynucleotides recited above. The polynucleotide can be DNA (genomic, cDNA, amplified, or synthetic) or RNA. Methods and algorithms for obtaining such polynucleotides are well known to those of skill in the art and can include, for example, methods for determining hybridization conditions that can routinely isolate polynucleotides of the desired sequence identities.

In accordance with the invention, polynucleotide sequences comprising the mature protein coding sequences corresponding to any one of SEQ ID NO: 1-87, 175-261 or 349-353, or functional equivalents thereof, may be used to generate recombinant DNA molecules that direct the expression of that nucleic acid, or a functional equivalent thereof, in appropriate host cells. Also included are the cDNA inserts of any of the clones identified herein.

A polynucleotide according to the invention can be joined to any of a variety of other nucleotide sequences by well-established recombinant DNA techniques (see Sambrook J et al. (1989) Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, NY). Useful nucleotide sequences for joining to polynucleotides include an assortment of vectors, e.g., plasmids, cosmids, lambda phage derivatives, phagemids, and the like, that are well known in the art. Accordingly, the invention also provides a vector including a polynucleotide of the invention and a host cell containing the polynucleotide. In general, the vector contains an origin of replication functional in at least one organism, convenient restriction endonuclease sites, and a selectable marker for the host cell. Vectors according to the invention include expression vectors, replication vectors, probe generation vectors, and sequencing vectors. A host cell according to the invention can be a prokaryotic or eukaryotic cell and can be a unicellular organism or part of a multicellular organism.

The present invention further provides recombinant constructs comprising a nucleic acid having any of the nucleotide sequences of SEQ ID NOs: 1-87, 175-261 or 349-353 or a fragment thereof or any other polynucleotides of the invention. In one embodiment, the recombinant constructs of the present invention comprise a vector, such as a plasmid or viral vector, into which a nucleic acid having any of the nucleotide sequences of SEQ ID NOs: 1-87, 175-261 or 349-353 or a fragment thereof is inserted, in a forward or reverse orientation. In the case of a vector comprising one of the ORFs of the present invention, the vector may further comprise

regulatory sequences, including for example, a promoter, operably linked to the ORF. Large numbers of suitable vectors and promoters are known to those of skill in the art and are commercially available for generating the recombinant constructs of the present invention. The following vectors are provided by way of example. Bacterial: pBS, phagescript, PsiX174, pBluescript SK, pBS KS, pNH8a, pNH16a, pNH18a, pNH46a (Stratagene); pTrc99A, pKK223-3, pKK233-3, pDR540, pRIT5 (Pharmacia). Eukaryotic: pWLneo, pSV2cat, pOG44, PXTI, pSG (Stratagene) pSVK3, pBPV, pMSG, pSVL (Pharmacia).

The isolated polynucleotide of the invention may be operably linked to an expression control sequence such as the pMT2 or pED expression vectors disclosed in Kaufman et al., *Nucleic Acids Res.* 19, 4485-4490 (1991), in order to produce the protein recombinantly. Many suitable expression control sequences are known in the art. General methods of expressing recombinant proteins are also known and are exemplified in R. Kaufman, *Methods in Enzymology* 185, 537-566 (1990). As defined herein "operably linked" means that the isolated polynucleotide of the invention and an expression control sequence are situated within a vector or cell in such a way that the protein is expressed by a host cell which has been transformed (transfected) with the ligated polynucleotide/expression control sequence.

Promoter regions can be selected from any desired gene using CAT (chloramphenicol transferase) vectors or other vectors with selectable markers. Two appropriate vectors are pKK232-8 and pCM7. Particular named bacterial promoters include lacI, lacZ, T3, T7, gpt, lambda PR, and trc. Eukaryotic promoters include CMV immediate early, HSV thymidine kinase, early and late SV40, LTRs from retrovirus, and mouse metallothionein-I. Selection of the appropriate vector and promoter is well within the level of ordinary skill in the art. Generally, recombinant expression vectors will include origins of replication and selectable markers permitting transformation of the host cell, e.g., the ampicillin resistance gene of *E. coli* and *S. cerevisiae* TRP1 gene, and a promoter derived from a highly-expressed gene to direct transcription of a downstream structural sequence. Such promoters can be derived from operons encoding glycolytic enzymes such as 3-phosphoglycerate kinase (PGK), a-factor, acid phosphatase, or heat shock proteins, among others. The heterologous structural sequence is assembled in appropriate phase with translation initiation and termination sequences, and preferably, a leader sequence capable of directing secretion of translated protein into the periplasmic space or extracellular medium. Optionally, the heterologous sequence can encode a fusion protein including an amino terminal identification peptide imparting desired characteristics, e.g., stabilization or simplified purification of expressed recombinant product. Useful expression vectors for bacterial use are constructed by inserting a structural DNA sequence encoding a desired protein together with suitable translation initiation and termination

signals in operable reading phase with a functional promoter. The vector will comprise one or more phenotypic selectable markers and an origin of replication to ensure maintenance of the vector and to, if desirable, provide amplification within the host. Suitable prokaryotic hosts for transformation include *E. coli*, *Bacillus subtilis*, *Salmonella typhimurium* and various species within the genera *Pseudomonas*, *Streptomyces*, and *Staphylococcus*, although others may also be employed as a matter of choice.

As a representative but non-limiting example, useful expression vectors for bacterial use can comprise a selectable marker and bacterial origin of replication derived from commercially available plasmids comprising genetic elements of the well known cloning vector pBR322 (ATCC 37017). Such commercial vectors include, for example, pKK223-3 (Pharmacia Fine Chemicals, Uppsala, Sweden) and GEM 1 (Promega Biotech, Madison, WI, USA). These pBR322 "backbone" sections are combined with an appropriate promoter and the structural sequence to be expressed. Following transformation of a suitable host strain and growth of the host strain to an appropriate cell density, the selected promoter is induced or derepressed by appropriate means (*e.g.*, temperature shift or chemical induction) and cells are cultured for an additional period. Cells are typically harvested by centrifugation, disrupted by physical or chemical means, and the resulting crude extract retained for further purification.

Polynucleotides of the invention can also be used to induce immune responses. For example, as described in Fan et al., *Nat. Biotech.* 17:870-872 (1999), incorporated herein by reference, nucleic acid sequences encoding a polypeptide may be used to generate antibodies against the encoded polypeptide following topical administration of naked plasmid DNA or following injection, and preferably intramuscular injection of the DNA. The nucleic acid sequences are preferably inserted in a recombinant expression vector and may be in the form of naked DNA.

3.3 ANTISENSE NUCLEIC ACIDS

Another aspect of the invention pertains to isolated antisense nucleic acid molecules that are hybridizable to or complementary to the nucleic acid molecule comprising the nucleotide sequence of SEQ ID NO: 1-87, 175-261 or 349-353, or fragments, analogs or derivatives thereof. An "antisense" nucleic acid comprises a nucleotide sequence that is complementary to a "sense" nucleic acid encoding a protein, *e.g.*, complementary to the coding strand of a double-stranded cDNA molecule or complementary to an mRNA sequence. In specific aspects, antisense nucleic acid molecules are provided that comprise a sequence complementary to at least about 10, 25, 50, 100, 250 or 500 nucleotides or an entire coding strand, or to only a portion thereof. Nucleic acid molecules encoding fragments, homologs, derivatives and analogs of a protein of any of

SEQ ID NO: 1-87, 175-261 or 349-353 or antisense nucleic acids complementary to a nucleic acid sequence of SEQ ID NO: 1-87, 175-261 or 349-353 are additionally provided.

In one embodiment, an antisense nucleic acid molecule is antisense to a "coding region" of the coding strand of a nucleotide sequence of the invention. The term "coding region" refers to the region of the nucleotide sequence comprising codons which are translated into amino acid residues. In another embodiment, the antisense nucleic acid molecule is antisense to a "noncoding region" of the coding strand of a nucleotide sequence of the invention. The term "noncoding region" refers to 5' and 3' sequences that flank the coding region that are not translated into amino acids (*i.e.*, also referred to as 5' and 3' untranslated regions).

Given the coding strand sequences encoding a nucleic acid disclosed herein (*e.g.*, SEQ ID NO: 1-87, 175-261 or 349-353, antisense nucleic acids of the invention can be designed according to the rules of Watson and Crick or Hoogsteen base pairing. The antisense nucleic acid molecule can be complementary to the entire coding region of an mRNA, but more preferably is an oligonucleotide that is antisense to only a portion of the coding or noncoding region of an mRNA. For example, the antisense oligonucleotide can be complementary to the region surrounding the translation start site of an mRNA. An antisense oligonucleotide can be, for example, about 5, 10, 15, 20, 25, 30, 35, 40, 45 or 50 nucleotides in length. An antisense nucleic acid of the invention can be constructed using chemical synthesis or enzymatic ligation reactions using procedures known in the art. For example, an antisense nucleic acid (*e.g.*, an antisense oligonucleotide) can be chemically synthesized using naturally occurring nucleotides or variously modified nucleotides designed to increase the biological stability of the molecules or to increase the physical stability of the duplex formed between the antisense and sense nucleic acids, *e.g.*, phosphorothioate derivatives and acridine substituted nucleotides can be used.

Examples of modified nucleotides that can be used to generate the antisense nucleic acid include: 5-fluorouracil, 5-bromouracil, 5-chlorouracil, 5-iodouracil, hypoxanthine, xanthine, 4-acetylcytosine, 5-(carboxyhydroxymethyl) uracil, 5-carboxymethylaminomethyl-2-thiouridine, 5-carboxymethylaminomethyluracil, dihydrouracil, beta-D-galactosylqueosine, inosine, N6-isopentenyladenine, 1-methylguanine, 1-methylinosine, 2,2-dimethylguanine, 2-methyladenine, 2-methylguanine, 3-methylcytosine, 5-methylcytosine, N6-adenine, 7-methylguanine, 5-methylaminomethyluracil, 5-methoxyaminomethyl-2-thiouracil, beta-D-mannosylqueosine, 5'-methoxycarboxymethyluracil, 5-methoxyuracil, 2-methylthio-N6-isopentenyladenine; uracil-5-oxyacetic acid (v), wybutoxosine, pseudouracil, queosine, 2-thiocytosine, 5-methyl-2-thiouracil, 2-thiouracil, 4-thiouracil, 5-methyluracil, uracil-5-oxyacetic acid methylester, uracil-5-oxyacetic acid (v), 5-methyl-2-thiouracil, 3-(3-amino-3-N-2-carboxypropyl) uracil, (acp3)w, and 2,6-diaminopurine. Alternatively, the

antisense nucleic acid can be produced biologically using an expression vector into which a nucleic acid has been subcloned in an antisense orientation (*i.e.*, RNA transcribed from the inserted nucleic acid will be of an antisense orientation to a target nucleic acid of interest, described further in the following subsection).

5 The antisense nucleic acid molecules of the invention are typically administered to a subject or generated *in situ* such that they hybridize with or bind to cellular mRNA and/or genomic DNA encoding a protein according to the invention to thereby inhibit expression of the protein, *e.g.*, by inhibiting transcription and/or translation. The hybridization can be by conventional nucleotide complementarity to form a stable duplex, or, for example, in the case of
10 an antisense nucleic acid molecule that binds to DNA duplexes, through specific interactions in the major groove of the double helix. An example of a route of administration of antisense nucleic acid molecules of the invention includes direct injection at a tissue site. Alternatively, antisense nucleic acid molecules can be modified to target selected cells and then administered systemically. For example, for systemic administration, antisense molecules can be modified
15 such that they specifically bind to receptors or antigens expressed on a selected cell surface, *e.g.*, by linking the antisense nucleic acid molecules to peptides or antibodies that bind to cell surface receptors or antigens. The antisense nucleic acid molecules can also be delivered to cells using the vectors described herein. To achieve sufficient intracellular concentrations of antisense molecules, vector constructs in which the antisense nucleic acid molecule is placed under the
20 control of a strong pol II or pol III promoter are preferred.

 In yet another embodiment, the antisense nucleic acid molecule of the invention is an α -anomeric nucleic acid molecule. An α -anomeric nucleic acid molecule forms specific double-stranded hybrids with complementary RNA in which, contrary to the usual β -units, the strands run parallel to each other (Gaultier *et al.* (1987) *Nucleic Acids Res* 15: 6625-6641). The
25 antisense nucleic acid molecule can also comprise a 2'-O-methylribonucleotide (Inoue *et al.* (1987) *Nucleic Acids Res* 15: 6131-6148) or a chimeric RNA-DNA analogue (Inoue *et al.* (1987) *FEBS Lett* 215: 327-330).

3.4 RIBOZYMES AND PNA MOIETIES

30 In still another embodiment, an antisense nucleic acid of the invention is a ribozyme. Ribozymes are catalytic RNA molecules with ribonuclease activity that are capable of cleaving a single-stranded nucleic acid, such as an mRNA, to which they have a complementary region. Thus, ribozymes (*e.g.*, hammerhead ribozymes (described in Haselhoff and Gerlach (1988) *Nature* 334:585-591)) can be used to catalytically cleave mRNA transcripts to thereby inhibit
35 translation of an mRNA. A ribozyme having specificity for a nucleic acid of the invention can

be designed based upon the nucleotide sequence of a DNA disclosed herein (*i.e.*, SEQ ID NO: 1-87, 175-261 or 349-353). For example, a derivative of Tetrahymena L-19 IVS RNA can be constructed in which the nucleotide sequence of the active site is complementary to the nucleotide sequence to be cleaved in a SECX-encoding mRNA. See, *e.g.*, Cech *et al.* U.S. Pat. No. 4,987,071; and Cech *et al.* U.S. Pat. No. 5,116,742. Alternatively, SECX mRNA can be used to select a catalytic RNA having a specific ribonuclease activity from a pool of RNA molecules. See, *e.g.*, Bartel *et al.*, (1993) *Science* 261:1411-1418.

Alternatively, gene expression can be inhibited by targeting nucleotide sequences complementary to the regulatory region (*e.g.*, promoter and/or enhancers) to form triple helical structures that prevent transcription of the gene in target cells. See generally, Helene. (1991) *Anticancer Drug Des.* 6: 569-84; Helene. *et al.* (1992) *Ann. N.Y. Acad. Sci.* 660:27-36; and Maher (1992) *Bioassays* 14: 807-15.

In various embodiments, the nucleic acids of the invention can be modified at the base moiety, sugar moiety or phosphate backbone to improve, *e.g.*, the stability, hybridization, or solubility of the molecule. For example, the deoxyribose phosphate backbone of the nucleic acids can be modified to generate peptide nucleic acids (see Hyrup *et al.* (1996) *Bioorg Med Chem* 4: 5-23). As used herein, the terms "peptide nucleic acids" or "PNAs" refer to nucleic acid mimics, *e.g.*, DNA mimics, in which the deoxyribose phosphate backbone is replaced by a pseudopeptide backbone and only the four natural nucleobases are retained. The neutral backbone of PNAs has been shown to allow for specific hybridization to DNA and RNA under conditions of low ionic strength. The synthesis of PNA oligomers can be performed using standard solid phase peptide synthesis protocols as described in Hyrup *et al.* (1996) above; Perry-O'Keefe *et al.* (1996) *PNAS* 93: 14670-675.

PNAs of the invention can be used in therapeutic and diagnostic applications. For example, PNAs can be used as antisense or antigene agents for sequence-specific modulation of gene expression by, *e.g.*, inducing transcription or translation arrest or inhibiting replication. PNAs of the invention can also be used, *e.g.*, in the analysis of single base pair mutations in a gene by, *e.g.*, PNA directed PCR clamping; as artificial restriction enzymes when used in combination with other enzymes, *e.g.*, S1 nucleases (Hyrup B. (1996) above); or as probes or primers for DNA sequence and hybridization (Hyrup *et al.* (1996), above; Perry-O'Keefe (1996), above).

In another embodiment, PNAs of the invention can be modified, *e.g.*, to enhance their stability or cellular uptake, by attaching lipophilic or other helper groups to PNA, by the formation of PNA-DNA chimeras, or by the use of liposomes or other techniques of drug delivery known in the art. For example, PNA-DNA chimeras can be generated that may

combine the advantageous properties of PNA and DNA. Such chimeras allow DNA recognition enzymes, e.g., RNase H and DNA polymerases, to interact with the DNA portion while the PNA portion would provide high binding affinity and specificity. PNA-DNA chimeras can be linked using linkers of appropriate lengths selected in terms of base stacking, number of bonds between

the nucleobases, and orientation (Hyrup (1996) above). The synthesis of PNA-DNA chimeras can be performed as described in Hyrup (1996) above and Finn *et al.* (1996) *Nucl Acids Res* 24: 3357-63. For example, a DNA chain can be synthesized on a solid support using standard phosphoramidite coupling chemistry, and modified nucleoside analogs, e.g., 5'-(4-methoxytrityl)amino-5'-deoxy-thymidine phosphoramidite, can be used between the PNA and the 5' end of DNA (Mag *et al.* (1989) *Nucl Acid Res* 17: 5973-88). PNA monomers are then coupled in a stepwise manner to produce a chimeric molecule with a 5' PNA segment and a 3' DNA segment (Finn *et al.* (1996) above). Alternatively, chimeric molecules can be synthesized with a 5' DNA segment and a 3' PNA segment. See, Petersen *et al.* (1975) *Bioorg Med Chem Lett* 5: 1119-11124.

In other embodiments, the oligonucleotide may include other appended groups such as peptides (e.g., for targeting host cell receptors *in vivo*), or agents facilitating transport across the cell membrane (see, e.g., Letsinger *et al.*, 1989, *Proc. Natl. Acad. Sci. U.S.A.* 86:6553-6556; Lemaitre *et al.*, 1987, *Proc. Natl. Acad. Sci.* 84:648-652; PCT Publication No. W088/09810) or the blood-brain barrier (see, e.g., PCT Publication No. W089/10134). In addition, oligonucleotides can be modified with hybridization triggered cleavage agents (See, e.g., Krol *et al.*, 1988, *BioTechniques* 6:958-976) or intercalating agents. (See, e.g., Zon, 1988, *Pharm. Res.* 5: 539-549). To this end, the oligonucleotide may be conjugated to another molecule, e.g., a peptide, a hybridization triggered cross-linking agent, a transport agent, a hybridization-triggered cleavage agent, etc.

3.5 HOSTS

The present invention further provides host cells genetically engineered to contain the polynucleotides of the invention. For example, such host cells may contain nucleic acids of the invention introduced into the host cell using known transformation, transfection or infection methods. The present invention still further provides host cells genetically engineered to express the polynucleotides of the invention, wherein such polynucleotides are in operative association with a regulatory sequence heterologous to the host cell which drives expression of the polynucleotides in the cell.

Knowledge of bone marrow-derived DNA sequences allows for modification of cells to permit, or increase, expression of bone marrow-derived polypeptide. Cells can be modified (e.g.,

by homologous recombination) to provide increased bone marrow-derived polypeptide expression by replacing, in whole or in part, the naturally occurring bone marrow specific promoter with all or part of a heterologous promoter so that the cells express bone marrow-derived polypeptide at higher levels. The heterologous promoter is inserted in such a manner
5 that it is operatively linked to bone marrow-derived polynucleotide-encoding sequences. See, for example, PCT International Publication No. WO94/12650, PCT International Publication No. WO92/20808, and PCT International Publication No. WO91/09955. It is also contemplated that, in addition to heterologous promoter DNA, amplifiable marker DNA (e.g., *ada*, *dhfr*, and the multifunctional CAD gene which encodes carbamyl phosphate synthase, aspartate
10 transcarbamylase, and dihydroorotase) and/or intron DNA may be inserted along with the heterologous promoter DNA. If linked to the bone marrow-derived polynucleotide-coding sequence, amplification of the marker DNA by standard selection methods results in co-amplification of the bone marrow-derived polynucleotide- coding sequences in the cells.

The host cell can be a higher eukaryotic host cell, such as a mammalian cell, a lower
15 eukaryotic host cell, such as a yeast cell, or the host cell can be a prokaryotic cell, such as a bacterial cell. Introduction of the recombinant construct into the host cell can be effected by calcium phosphate transfection, DEAE, dextran mediated transfection, or electroporation (Davis, L. et al., *Basic Methods in Molecular Biology* (1986)). The host cells containing one of the polynucleotides of the invention, can be used in conventional manners to produce the gene
20 product encoded by the isolated fragment (in the case of an ORF) or can be used to produce a heterologous protein under the control of the EMF.

Any host/vector system can be used to express one or more of the ORFs of the present invention. These include, but are not limited to, eukaryotic hosts such as HeLa cells, Cv-1 cell, COS cells, 293 cells, and Sf9 cells, as well as prokaryotic host such as *E. coli* and *B. subtilis*.
25 The most preferred cells are those which do not normally express the particular polypeptide or protein or which expresses the polypeptide or protein at low natural levels. Mature proteins can be expressed in mammalian cells, yeast, bacteria, or other cells under the control of appropriate promoters. Cell-free translation systems can also be employed to produce such proteins using RNAs derived from the DNA constructs of the present invention. Appropriate cloning and
30 expression vectors for use with prokaryotic and eukaryotic hosts are described by Sambrook, et al., in *Molecular Cloning: A Laboratory Manual*, Second Edition, Cold Spring Harbor, New York (1989), the disclosure of which is hereby incorporated by reference.

Various mammalian cell culture systems can also be employed to express recombinant protein. Examples of mammalian expression systems include the COS-7 lines of monkey kidney
35 fibroblasts, described by Gluzman, *Cell* 23:175 (1981). Other cell lines capable of expressing a

compatible vector are, for example, the C127, monkey COS cells, Chinese Hamster Ovary (CHO) cells, human kidney 293 cells, human epidermal A431 cells, human Colo205 cells, 3T3 cells, CV-1 cells, other transformed primate cell lines, normal diploid cells, cell strains derived from *in vitro* culture of primary tissue, primary explants, HeLa cells, mouse L cells, BHK, HL-60, U937, HaK or Jurkat cells. Mammalian expression vectors will comprise an origin of replication, a suitable promoter and also any necessary ribosome binding sites, polyadenylation site, splice donor and acceptor sites, transcriptional termination sequences, and 5' flanking nontranscribed sequences. DNA sequences derived from the SV40 viral genome, for example, SV40 origin, early promoter, enhancer, splice, and polyadenylation sites may be used to provide the required nontranscribed genetic elements. Recombinant polypeptides and proteins produced in bacterial culture are usually isolated by initial extraction from cell pellets, followed by one or more salting-out, aqueous ion exchange or size exclusion chromatography steps. Protein refolding steps can be used, as necessary, in completing configuration of the mature protein. Finally, high performance liquid chromatography (HPLC) can be employed for final purification steps. Microbial cells employed in expression of proteins can be disrupted by any convenient method, including freeze-thaw cycling, sonication, mechanical disruption, or use of cell lysing agents.

Alternatively, it may be possible to produce the protein in lower eukaryotes such as yeast or insects or in prokaryotes such as bacteria. Potentially suitable yeast strains include *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*, *Kluyveromyces* strains, *Candida*, or any yeast strain capable of expressing heterologous proteins. Potentially suitable bacterial strains include *Escherichia coli*, *Bacillus subtilis*, *Salmonella typhimurium*, or any bacterial strain capable of expressing heterologous proteins. If the protein is made in yeast or bacteria, it may be necessary to modify the protein produced therein, for example by phosphorylation or glycosylation of the appropriate sites, in order to obtain the functional protein. Such covalent attachments may be accomplished using known chemical or enzymatic methods.

In another embodiment of the present invention, cells and tissues may be engineered to express an endogenous gene comprising the polynucleotides of the invention under the control of inducible regulatory elements, in which case the regulatory sequences of the endogenous gene may be replaced by homologous recombination. As described herein, gene targeting can be used to replace a gene's existing regulatory region with a regulatory sequence isolated from a different gene or a novel regulatory sequence synthesized by genetic engineering methods. Such regulatory sequences may be comprised of promoters, enhancers, scaffold-attachment regions, negative regulatory elements, transcriptional initiation sites, regulatory protein binding sites or combinations of said sequences. Alternatively, sequences which affect the structure or stability

of the RNA or protein produced may be replaced, removed, added, or otherwise modified by targeting. These sequences include polyadenylation signals, mRNA stability elements, splice sites, leader sequences for enhancing or modifying transport or secretion properties of the protein, or other sequences which alter or improve the function or stability of protein or RNA molecules.

The targeting event may be a simple insertion of the regulatory sequence, placing the gene under the control of the new regulatory sequence, *e.g.*, inserting a new promoter or enhancer or both upstream of a gene. Alternatively, the targeting event may be a simple deletion of a regulatory element, such as the deletion of a tissue-specific negative regulatory element.

Alternatively, the targeting event may replace an existing element; for example, a tissue-specific enhancer can be replaced by an enhancer that has broader or different cell-type specificity than the naturally occurring elements. Here, the naturally occurring sequences are deleted and new sequences are added. In all cases, the identification of the targeting event may be facilitated by the use of one or more selectable marker genes that are contiguous with the targeting DNA, allowing for the selection of cells in which the exogenous DNA has integrated into the host cell genome. The identification of the targeting event may also be facilitated by the use of one or more marker genes exhibiting the property of negative selection, such that the negatively selectable marker is linked to the exogenous DNA, but configured such that the negatively selectable marker flanks the targeting sequence, and such that a correct homologous recombination event with sequences in the host cell genome does not result in the stable integration of the negatively selectable marker. Markers useful for this purpose include the Herpes Simplex Virus thymidine kinase (TK) gene or the bacterial xanthine-guanine phosphoribosyl-transferase (gpt) gene.

The gene targeting or gene activation techniques which can be used in accordance with this aspect of the invention are more particularly described in U.S. Patent No. 5,272,071 to Chappel; U.S. Patent No. 5,578,461 to Sherwin et al.; International Application No. PCT/US92/09627 (WO93/09222) by Selden et al.; and International Application No. PCT/US90/06436 (WO91/06667) by Skoultchi et al., each of which is incorporated by reference herein in its entirety.

3.6 POLYPEPTIDES OF THE INVENTION

The isolated polypeptides of the invention include, but are not limited to, a polypeptide comprising: the amino acid sequences set forth as any one of SEQ ID NO: 88 – 174, 262-348 or 354-358 or an amino acid sequence encoded by any one of the nucleotide sequences SEQ ID NOs: 1-87, 175-261 or 349-353 or the corresponding full length or mature protein. Polypeptides

of the invention also include polypeptides preferably with biological or immunological activity that are encoded by: (a) a polynucleotide having any one of the nucleotide sequences set forth in SEQ ID NOs: 1-87, 175-261 or 349-353 or (b) polynucleotides encoding any one of the amino acid sequences set forth as SEQ ID NO: 88 – 174, 262-348 or 354-358 or (c) polynucleotides that hybridize to the complement of the polynucleotides of either (a) or (b) under stringent hybridization conditions. The invention also provides biologically active or immunologically active variants of any of the amino acid sequences set forth as SEQ ID NO: 88 – 174, 262-348 or 354-358 or the corresponding full length or mature protein; and “substantial equivalents” thereof (e.g., with at least about 65%, at least about 70%, at least about 75%, at least about 80%, at least about 85%, 86%, 87%, 88%, 89%, at least about 90%, 91%, 92%, 93%, 94%, typically at least about 95%, 96%, 97%, more typically at least about 98%, or most typically at least about 99% amino acid identity) that retain biological activity. Polypeptides encoded by allelic variants may have a similar, increased, or decreased activity compared to polypeptides comprising SEQ ID NO: 88 – 174, 262-348 or 354-358.

Fragments of the proteins of the present invention that are capable of exhibiting biological activity are also encompassed by the present invention. Fragments of the protein may be in linear form or they may be cyclized using known methods, for example, as described in H. U. Saragovi, et al., *Bio/Technology* 10, 773-778 (1992) and in R. S. McDowell, et al., *J. Amer. Chem. Soc.* 114, 9245-9253 (1992), both of which are incorporated herein by reference. Such fragments may be fused to carrier molecules such as immunoglobulins for many purposes, including increasing the valency of protein binding sites.

The present invention also provides both full-length and mature forms (for example, without a signal sequence or precursor sequence) of the disclosed proteins. The protein coding sequence is identified in the sequence listing by translation of the disclosed nucleotide sequences. The mature form of such protein may be obtained by expression of a full-length polynucleotide in a suitable mammalian cell or other host cell. The sequence of the mature form of the protein is also determinable from the amino acid sequence of the full-length form. Where proteins of the present invention are membrane bound, soluble forms of the proteins are also provided. In such forms, part or all of the regions causing the proteins to be membrane bound are deleted so that the proteins are fully secreted from the cell in which it is expressed.

Protein compositions of the present invention may further comprise an acceptable carrier, such as a hydrophilic, e.g., pharmaceutically acceptable, carrier.

The present invention further provides isolated polypeptides encoded by the nucleic acid fragments of the present invention or by degenerate variants of the nucleic acid fragments of the present invention. By “degenerate variant” is intended nucleotide fragments that differ from a

nucleic acid fragment of the present invention (*e.g.*, an ORF) by nucleotide sequence but, due to the degeneracy of the genetic code, encode an identical polypeptide sequence. Preferred nucleic acid fragments of the present invention are the ORFs that encode proteins.

A variety of methodologies known in the art can be utilized to obtain any one of the isolated polypeptides or proteins of the present invention. At the simplest level, the amino acid sequence can be synthesized using commercially available peptide synthesizers. The synthetically-constructed protein sequences, by virtue of sharing primary, secondary or tertiary structural and/or conformational characteristics with proteins may possess biological properties in common therewith, including protein activity. This technique is particularly useful in producing small peptides and fragments of larger polypeptides. Fragments are useful, for example, in generating antibodies against the native polypeptide. Thus, they may be employed as biologically active or immunological substitutes for natural, purified proteins in screening of therapeutic compounds and in immunological processes for the development of antibodies.

The polypeptides and proteins of the present invention can alternatively be purified from cells that have been altered to express the desired polypeptide or protein. As used herein, a cell is said to be altered to express a desired polypeptide or protein when the cell, through genetic manipulation, is made to produce a polypeptide or protein which it normally does not produce or which the cell normally produces at a lower level. One skilled in the art can readily adapt procedures for introducing and expressing either recombinant or synthetic sequences into eukaryotic or prokaryotic cells in order to generate a cell that produces one of the polypeptides or proteins of the present invention.

The invention also relates to methods for producing a polypeptide comprising growing a culture of host cells of the invention in a suitable culture medium, and purifying the protein from the cells or the culture in which the cells are grown. For example, the methods of the invention include a process for producing a polypeptide in which a host cell containing a suitable expression vector that includes a polynucleotide of the invention is cultured under conditions that allow expression of the encoded polypeptide. The polypeptide can be recovered from the culture, conveniently from the culture medium, or from a lysate prepared from the host cells and further purified. Preferred embodiments include those in which the protein produced by such process is a full length or mature form of the protein.

In an alternative method, the polypeptide or protein is purified from bacterial cells that naturally produce the polypeptide or protein. One skilled in the art can readily follow known methods for isolating polypeptides and proteins in order to obtain one of the isolated polypeptides or proteins of the present invention. These include, but are not limited to, immunochromatography, HPLC, size-exclusion chromatography, ion-exchange chromatography,

and immuno-affinity chromatography. See, e.g., Scopes, *Protein Purification: Principles and Practice*, Springer-Verlag (1994); Sambrook, et al., in *Molecular Cloning: A Laboratory Manual*; Ausubel et al., *Current Protocols in Molecular Biology*. Polypeptide fragments that retain biological/immunological activity include fragments comprising greater than about 100
5 amino acids, or greater than about 200 amino acids, and fragments that encode specific protein domains.

The purified polypeptides can be used in *in vitro* binding assays that are well known in the art to identify molecules that bind to the polypeptides. These molecules include but are not limited to, for e.g., small molecules, molecules from combinatorial libraries, antibodies or other
10 proteins. The molecules identified in the binding assay are then tested for antagonist or agonist activity in *in vivo* tissue culture or animal models that are well known in the art. In brief, the molecules are titrated into a plurality of cell cultures or animals and then tested for either cell/animal death or prolonged survival of the animal/cells.

In addition, the peptides of the invention or molecules capable of binding to the peptides
15 may be complexed with toxins, e.g., ricin or cholera, or with other compounds that are toxic to cells. The toxin-binding molecule complex is then targeted to a tumor or other cell by the specificity of the binding molecule for SEQ ID NO: 88 – 174, 262-348 or 354-358.

The protein of the invention may also be expressed as a product of transgenic animals, e.g., as a component of the milk of transgenic cows, goats, pigs, or sheep which are characterized
20 by somatic or germ cells containing a nucleotide sequence encoding the protein.

The proteins provided herein also include proteins characterized by amino acid sequences similar to those of purified proteins but into which modification are naturally provided or deliberately engineered. For example, modifications, in the peptide or DNA sequence, can be made by those skilled in the art using known techniques. Modifications of interest in the protein
25 sequences may include the alteration, substitution, replacement, insertion or deletion of a selected amino acid residue in the coding sequence. For example, one or more of the cysteine residues may be deleted or replaced with another amino acid to alter the conformation of the molecule. Techniques for such alteration, substitution, replacement, insertion or deletion are well known to those skilled in the art (see, e.g., U.S. Pat. No. 4,518,584). Preferably, such
30 alteration, substitution, replacement, insertion or deletion retains the desired activity of the protein. Regions of the protein that are important for the protein function can be determined by various methods known in the art including the alanine-scanning method which involved systematic substitution of single or strings of amino acids with alanine, followed by testing the resulting alanine-containing variant for biological activity. This type of analysis determines the

importance of the substituted amino acid(s) in biological activity. Regions of the protein that are important for protein function may be determined by the eMATRIX program.

Other fragments and derivatives of the sequences of proteins which would be expected to retain protein activity in whole or in part and are useful for screening or other immunological methodologies may also be easily made by those skilled in the art given the disclosures herein. Such modifications are encompassed by the present invention.

The protein may also be produced by operably linking the isolated polynucleotide of the invention to suitable control sequences in one or more insect expression vectors, and employing an insect expression system. Materials and methods for baculovirus/insect cell expression systems are commercially available in kit form from, *e.g.*, Invitrogen, San Diego, Calif., U.S.A. (the MaxBat™ kit), and such methods are well known in the art, as described in Summers and Smith, Texas Agricultural Experiment Station Bulletin No. 1555 (1987), incorporated herein by reference. As used herein, an insect cell capable of expressing a polynucleotide of the present invention is "transformed."

The protein of the invention may be prepared by culturing transformed host cells under culture conditions suitable to express the recombinant protein. The resulting expressed protein may then be purified from such culture (*i.e.*, from culture medium or cell extracts) using known purification processes, such as gel filtration and ion exchange chromatography. The purification of the protein may also include an affinity column containing agents which will bind to the protein; one or more column steps over such affinity resins as concanavalin A-agarose, heparin-toyopearl™ or Cibacrom blue 3GA Sepharose™; one or more steps involving hydrophobic interaction chromatography using such resins as phenyl ether, butyl ether, or propyl ether; or immunoaffinity chromatography.

Alternatively, the protein of the invention may also be expressed in a form, which will facilitate purification. For example, it may be expressed as a fusion protein, such as those of maltose binding protein (MBP), glutathione-S-transferase (GST) or thioredoxin (TRX), or as a His tag. Kits for expression and purification of such fusion proteins are commercially available from New England BioLabs (Beverly, Mass.), Pharmacia (Piscataway, N.J.) and Invitrogen, respectively. The protein can also be tagged with an epitope and subsequently purified by using a specific antibody directed to such epitope. One such epitope ("FLAG®") is commercially available from Kodak (New Haven, Conn.).

Finally, one or more reverse-phase high performance liquid chromatography (RP- HPLC) steps employing hydrophobic RP-HPLC media, *e.g.*, silica gel having pendant methyl or other aliphatic groups can be employed to further purify the protein. Some or all of the foregoing purification steps, in various combinations, can also be employed to provide a substantially

homogeneous isolated recombinant protein. The protein thus purified is substantially free of other mammalian proteins and is defined in accordance with the present invention as an "isolated protein."

The polypeptides of the invention include analogs (variants). This embraces fragments, as well as peptides in which one or more amino acids has been deleted, inserted, or substituted. Also, analogs of the polypeptides of the invention embrace fusions of the polypeptides or modifications of the polypeptides of the invention, wherein the polypeptide or analog is fused to another moiety or moieties, e.g., targeting moiety or another therapeutic agent. Such analogs may exhibit improved properties such as activity and/or stability. Examples of moieties which may be fused to the polypeptide or an analog include, for example, targeting moieties which provide for the delivery of polypeptide to pancreatic cells, e.g., antibodies to pancreatic cells, antibodies to immune cells such as T-cells, monocytes, dendritic cells, granulocytes, etc., as well as receptor and ligands expressed on pancreatic or immune cells. Other moieties, which may be fused to the polypeptide, include therapeutic agents that are used for treatment, for example, immunosuppressive drugs such as cyclosporin, SK506, azathioprine, CD3 antibodies and steroids. Also, polypeptides may be fused to immune modulators, and other cytokines such as alpha or beta interferon.

3.6.1 DETERMINING POLYPEPTIDE AND POLYNUCLEOTIDE IDENTITY AND SIMILARITY

Preferred identity and/or similarity are designed to give the largest match between the sequences tested. Methods to determine identity and similarity are codified in computer programs including, but are not limited to, the GCG program package, including GAP (Devereux, J., et al., Nucleic Acids Research 12(1):387 (1984); Genetics Computer Group, University of Wisconsin, Madison, WI), BLASTP, BLASTN, BLASTX, FASTA (Altschul, S.F. et al., J. Mol. Biol. 215:403-410 (1990), PSI-BLAST (Altschul S.F. et al., Nucleic Acids Res. vol. 25, pp. 3389-3402, herein incorporated by reference), eMATRIX software (Wu et al., J. Comp. Biol., Vol. 6, pp. 219-235 (1999), herein incorporated by reference), eMotif software (Nevill-Manning et al, ISMB-97, Vol. 4, pp. 202-209, herein incorporated by reference), PFam software (Sonnhammer et al., Nucleic Acids Res., Vol. 26(1), pp. 320-322 (1998), herein incorporated by reference), SignalP software package (Nielsen H et al., Int. J. Neural Syst., Vol. 8, pp. 581 – 599 (1997), herein incorporated by reference) and the Kyte-Doolittle hydrophobicity prediction algorithm (J. Mol. Biol, 157, pp. 105-31 (1982), incorporated herein by reference). The BLAST programs are publicly available from the National Center for

Biotechnology Information (NCBI) and other sources (BLAST Manual, Altschul, S., et al. NCB
NLM NIH Bethesda, MD 20894; Altschul, S., et al., J. Mol. Biol. 215:403-410 (1990).

3.7 CHIMERIC AND FUSION PROTEINS

The invention also provides chimeric or fusion proteins. As used herein, a "chimeric
5 protein" or "fusion protein" comprises a polypeptide of the invention operatively linked to
another polypeptide. Within a fusion protein the polypeptide according to the invention can
correspond to all or a portion of a protein according to the invention. In one embodiment, a
fusion protein comprises at least one biologically active portion of a protein according to the
invention. In another embodiment, a fusion protein comprises at least two biologically active
10 portions of a protein according to the invention. Within the fusion protein, the term "operatively
linked" is intended to indicate that the polypeptide according to the invention and the other
polypeptide are fused in-frame to each other. The polypeptide can be fused to the N-terminus or
C-terminus, or to the middle.

For example, in one embodiment a fusion protein comprises a polypeptide according to
15 the invention operably linked to the extracellular domain of a second protein.

In another embodiment, the fusion protein is a GST-fusion protein in which the
polypeptide sequences of the invention are fused to the C-terminus of the GST (i.e., glutathione
S-transferase) sequences.

In another embodiment, the fusion protein is an immunoglobulin fusion protein in which
20 the polypeptide sequences according to the invention comprise one or more domains fused to
sequences derived from a member of the immunoglobulin protein family. The immunoglobulin
fusion proteins of the invention can be incorporated into pharmaceutical compositions and
administered to a subject to inhibit an interaction between a ligand and a protein of the invention
on the surface of a cell, to thereby suppress signal transduction *in vivo*. The immunoglobulin
25 fusion proteins can be used to affect the bioavailability of a cognate ligand. Inhibition of the
ligand/protein interaction may be useful therapeutically for both the treatment of proliferative
and differentiative disorders, *e.g.*, cancer as well as modulating (*e.g.*, promoting or inhibiting)
cell survival. Moreover, the immunoglobulin fusion proteins of the invention can be used as
immunogens to produce antibodies in a subject, to purify ligands, and in screening assays to
30 identify molecules that inhibit the interaction of a polypeptide of the invention with a ligand.

A chimeric or fusion protein of the invention can be produced by standard recombinant
DNA techniques. For example, DNA fragments coding for the different polypeptide sequences
are ligated together in-frame in accordance with conventional techniques, *e.g.*, by employing
blunt-ended or stagger-ended termini for ligation, restriction enzyme digestion to provide for
35 appropriate termini, filling-in of cohesive ends as appropriate, alkaline phosphatase treatment to

avoid undesirable joining, and enzymatic ligation. In another embodiment, the fusion gene can be synthesized by conventional techniques including automated DNA synthesizers.

Alternatively, PCR amplification of gene fragments can be carried out using anchor primers that give rise to complementary overhangs between two consecutive gene fragments that can

5 subsequently be annealed and reamplified to generate a chimeric gene sequence (see, for example, Ausubel et al. (eds.) CURRENT PROTOCOLS IN MOLECULAR BIOLOGY, John Wiley & Sons, 1992). Moreover, many expression vectors are commercially available that already encode a fusion moiety (e.g., a GST polypeptide). A nucleic acid encoding a polypeptide of the invention can be cloned into such an expression vector such that the fusion moiety is linked
10 in-frame to the protein of the invention

3.8 GENE THERAPY

Mutations in the polynucleotides of the invention gene may result in loss of normal function of the encoded protein. The invention thus provides gene therapy to restore normal
15 activity of the polypeptides of the invention; or to treat disease states involving polypeptides of the invention. Delivery of a functional gene encoding polypeptides of the invention to appropriate cells is effected *ex vivo*, *in situ*, or *in vivo* by use of vectors, and more particularly viral vectors (e.g., adenovirus, adeno-associated virus, or a retrovirus), or *ex vivo* by use of physical DNA transfer methods (e.g., liposomes or chemical treatments). See, for example,
20 Anderson, Nature, supplement to vol. 392, no. 6679, pp.25-20 (1998). For additional reviews of gene therapy technology see Friedmann, Science, 244: 1275-1281 (1989); Verma, Scientific American: 68-84 (1990); and Miller, Nature, 357: 455-460 (1992). Introduction of any one of the nucleotides of the present invention or a gene encoding the polypeptides of the present invention can also be accomplished with extrachromosomal substrates (transient expression) or
25 artificial chromosomes (stable expression). Cells may also be cultured *ex vivo* in the presence of proteins of the present invention in order to proliferate or to produce a desired effect on or activity in such cells. Treated cells can then be introduced *in vivo* for therapeutic purposes. Alternatively, it is contemplated that in other human disease states, preventing the expression of or inhibiting the activity of polypeptides of the invention will be useful in treating the disease
30 states. It is contemplated that antisense therapy or gene therapy could be applied to negatively regulate the expression of polypeptides of the invention.

Other methods inhibiting expression of a protein include the introduction of antisense molecules to the nucleic acids of the present invention, their complements, or their translated RNA sequences, by methods known in the art. Further, the polypeptides of the present invention can be

inhibited by using targeted deletion methods, or the insertion of a negative regulatory element such as a silencer, which is tissue specific.

The present invention still further provides cells genetically engineered *in vivo* to express the polynucleotides of the invention, wherein such polynucleotides are in operative association with a regulatory sequence heterologous to the host cell, which drives expression of the polynucleotides in the cell. These methods can be used to increase or decrease the expression of the polynucleotides of the present invention.

Knowledge of DNA sequences provided by the invention allows for modification of cells to permit, increase, or decrease, expression of endogenous polypeptide. Cells can be modified (e.g., by homologous recombination) to provide increased polypeptide expression by replacing, in whole or in part, the naturally occurring promoter with all or part of a heterologous promoter so that the cells express the protein at higher levels. The heterologous promoter is inserted in such a manner that it is operatively linked to the desired protein encoding sequences. See, for example, PCT International Publication No. WO 94/12650, PCT International Publication No. WO 92/20808, and PCT International Publication No. WO 91/09955. It is also contemplated that, in addition to heterologous promoter DNA, amplifiable marker DNA (e.g., *ada*, *dhfr*, and the multifunctional CAD gene which encodes carbamyl phosphate synthase, aspartate transcarbamylase, and dihydroorotase) and/or intron DNA may be inserted along with the heterologous promoter DNA. If linked to the desired protein coding sequence, amplification of the marker DNA by standard selection methods results in co-amplification of the desired protein coding sequences in the cells.

In another embodiment of the present invention, cells and tissues may be engineered to express an endogenous gene comprising the polynucleotides of the invention under the control of inducible regulatory elements, in which case the regulatory sequences of the endogenous gene may be replaced by homologous recombination. As described herein, gene targeting can be used to replace a gene's existing regulatory region with a regulatory sequence isolated from a different gene or a novel regulatory sequence synthesized by genetic engineering methods. Such regulatory sequences may be comprised of promoters, enhancers, scaffold-attachment regions, negative regulatory elements, transcriptional initiation sites, regulatory protein binding sites or combinations of said sequences. Alternatively, sequences that affect the structure or stability of the RNA or protein produced may be replaced, removed, added, or otherwise modified by targeting. These sequences include polyadenylation signals, mRNA stability elements, splice sites, leader sequences for enhancing or modifying transport or secretion properties of the protein, or other sequences that alter or improve the function or stability of protein or RNA molecules.

The targeting event may be a simple insertion of the regulatory sequence, placing the gene under the control of the new regulatory sequence, e.g., inserting a new promoter or enhancer or both

upstream of a gene. Alternatively, the targeting event may be a simple deletion of a regulatory element, such as the deletion of a tissue-specific negative regulatory element. Alternatively, the targeting event may replace an existing element; for example, a tissue-specific enhancer can be replaced by an enhancer that has broader or different cell-type specificity than the naturally occurring elements. Here, the naturally occurring sequences are deleted and new sequences are added. In all cases, the identification of the targeting event may be facilitated by the use of one or more selectable marker genes that are contiguous with the targeting DNA, allowing for the selection of cells in which the exogenous DNA has integrated into the cell genome. The identification of the targeting event may also be facilitated by the use of one or more marker genes exhibiting the property of negative selection, such that the negatively selectable marker is linked to the exogenous DNA, but configured such that the negatively selectable marker flanks the targeting sequence, and such that a correct homologous recombination event with sequences in the host cell genome does not result in the stable integration of the negatively selectable marker. Markers useful for this purpose include the Herpes Simplex Virus thymidine kinase (TK) gene or the bacterial xanthine-guanine phosphoribosyl-transferase (gpt) gene.

The gene targeting or gene activation techniques that can be used in accordance with this aspect of the invention are more particularly described in U.S. Patent No. 5,272,071 to Chappell; U.S. Patent No. 5,578,461 to Sherwin et al.; International Application No. PCT/US92/09627 (WO93/09222) by Selden et al.; and International Application No. PCT/US90/06436 (WO91/06667) by Skoultchi et al., each of which is incorporated by reference herein in its entirety.

3.9 TRANSGENIC ANIMALS

In preferred methods to determine biological functions of the polypeptides of the invention in vivo, one or more genes provided by the invention are either over expressed or inactivated in the germ line of animals using homologous recombination [Capecchi, Science 244:1288-1292 (1989)]. Animals in which the gene is over expressed, under the regulatory control of exogenous or endogenous promoter elements, are known as transgenic animals. Animals in which an endogenous gene has been inactivated by homologous recombination are referred to as "knockout" animals. Knockout animals, preferably non-human mammals, can be prepared as described in U.S. Patent No. 5,557,032, incorporated herein by reference. Transgenic animals are useful to determine the roles polypeptides of the invention play in biological processes, and preferably in disease states. Transgenic animals are useful as model systems to identify compounds that modulate lipid metabolism. Transgenic animals, preferably non-human mammals, are produced using methods as described in U.S. Patent No 5,489,743 and PCT Publication No. WO94/28122, incorporated herein by reference.

Transgenic animals can be prepared wherein all or part of a promoter of the polynucleotides of the invention is either activated or inactivated to alter the level of expression of the polypeptides of the invention. Inactivation can be carried out using homologous recombination methods described above. Activation can be achieved by supplementing or even
5 replacing the homologous promoter to provide for increased protein expression. The homologous promoter can be supplemented by insertion of one or more heterologous enhancer elements known to confer promoter activation in a particular tissue.

The polynucleotides of the present invention also make possible the development, through, e.g., homologous recombination or knock out strategies, of animals that fail to express
10 polypeptides of the invention or that express a variant polypeptide. Such animals are useful as models for studying the *in vivo* activities of polypeptide as well as for studying modulators of the polypeptides of the invention.

3.10 USES AND BIOLOGICAL ACTIVITY

15 The polynucleotides and proteins of the present invention are expected to exhibit one or more of the uses or biological activities (including those associated with assays cited herein) identified herein. Uses or activities described for proteins of the present invention may be provided by administration or use of such proteins or of polynucleotides encoding such proteins (such as, for example, in gene therapies or vectors suitable for introduction of DNA). The
20 mechanism underlying the particular condition or pathology will dictate whether the polypeptides of the invention, the polynucleotides of the invention or modulators (activators or inhibitors) thereof would be beneficial to the subject in need of treatment. Thus, "therapeutic compositions of the invention" include compositions comprising isolated polynucleotides (including recombinant DNA molecules, cloned genes and degenerate variants thereof) or
25 polypeptides of the invention (including full length protein, mature protein and truncations or domains thereof), or compounds and other substances that modulate the overall activity of the target gene products, either at the level of target gene/protein expression or target protein activity. Such modulators include polypeptides, analogs, (variants), including fragments and fusion proteins, antibodies and other binding proteins; chemical compounds that directly or
30 indirectly activate or inhibit the polypeptides of the invention (identified, e.g., via drug screening assays as described herein); antisense polynucleotides and polynucleotides suitable for triple helix formation; and in particular antibodies or other binding partners that specifically recognize one or more epitopes of the polypeptides of the invention.

The polypeptides of the present invention may likewise be involved in cellular activation
35 or in one of the other physiological pathways described herein.

3.10.1 RESEARCH USES AND UTILITIES

The research community can use the polynucleotides provided by the present invention for various purposes. The polynucleotides can be used to express recombinant protein for analysis, characterization or therapeutic use; as markers for tissues in which the corresponding protein is preferentially expressed (either constitutively or at a particular stage of tissue differentiation or development or in disease states); as molecular weight markers on gels; as chromosome markers or tags (when labeled) to identify chromosomes or to map related gene positions; to compare with endogenous DNA sequences in patients to identify potential genetic disorders; as probes to hybridize and thus discover novel, related DNA sequences; as a source of information to derive PCR primers for genetic fingerprinting; as a probe to "subtract-out" known sequences in the process of discovering other novel polynucleotides; for selecting and making oligomers for attachment to a "gene chip" or other support, including for examination of expression patterns; to raise anti-protein antibodies using DNA immunization techniques; and as an antigen to raise anti-DNA antibodies or elicit another immune response. Where the polynucleotide encodes a protein which binds or potentially binds to another protein (such as, for example, in a receptor-ligand interaction), the polynucleotide can also be used in interaction trap assays (such as, for example, that described in Gyuris et al., Cell 75:791-803 (1993)) to identify polynucleotides encoding the other protein with which binding occurs or to identify inhibitors of the binding interaction.

The polypeptides provided by the present invention can similarly be used in assays to determine biological activity, including in a panel of multiple proteins for high-throughput screening; to raise antibodies or to elicit another immune response; as a reagent (including the labeled reagent) in assays designed to quantitatively determine levels of the protein (or its receptor) in biological fluids; as markers for tissues in which the corresponding polypeptide is preferentially expressed (either constitutively or at a particular stage of tissue differentiation or development or in a disease state); and, of course, to isolate correlative receptors or ligands. Proteins involved in these binding interactions can also be used to screen for peptide or small molecule inhibitors or agonists of the binding interaction.

Any or all of these research utilities are capable of being developed into reagent grade or kit format for commercialization as research products.

Methods for performing the uses listed above are well known to those skilled in the art. References disclosing such methods include without limitation "Molecular Cloning: A Laboratory Manual", 2d ed., Cold Spring Harbor Laboratory Press, Sambrook, J., E. F. Fritsch

and T. Maniatis eds., 1989, and "Methods in Enzymology: Guide to Molecular Cloning Techniques", Academic Press, Berger, S. L. and A. R. Kimmel eds., 1987.

3.10.2 NUTRITIONAL USES

5 Polynucleotides and polypeptides of the present invention can also be used as nutritional sources or supplements. Such uses include without limitation use as a protein or amino acid supplement, use as a carbon source, use as a nitrogen source and use as a source of carbohydrate. In such cases the polypeptide or polynucleotide of the invention can be added to the feed of a particular organism or can be administered as a separate solid or liquid preparation, such as in the
10 form of powder, pills, solutions, suspensions or capsules. In the case of microorganisms, the polypeptide or polynucleotide of the invention can be added to the medium in or on which the microorganism is cultured.

3.10.3 CYTOKINE AND CELL PROLIFERATION/DIFFERENTIATION

15 ACTIVITY

A polypeptide of the present invention may exhibit activity relating to cytokine, cell proliferation (either inducing or inhibiting) or cell differentiation (either inducing or inhibiting) activity or may induce production of other cytokines in certain cell populations. A polynucleotide of the invention can encode a polypeptide exhibiting such attributes. Many
20 protein factors discovered to date, including all known cytokines, have exhibited activity in one or more factor-dependent cell proliferation assays, and hence the assays serve as a convenient confirmation of cytokine activity. The activity of therapeutic compositions of the present invention is evidenced by any one of a number of routine factor dependent cell proliferation assays for cell lines including, without limitation, 32D, DA2, DA1G, T10, B9, B9/11, BaF3, MC9/G, M+(preB M+), 2E8, RB5, DA1, 123, T1165, HT2, CTLL2, TF-1, Mo7e, CMK,
25 HUVEC, and Caco. Therapeutic compositions of the invention can be used in the following:

Assays for T-cell or thymocyte proliferation include without limitation those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3,
30 *In Vitro* assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Takai et al., J. Immunol. 137:3494-3500, 1986; Bertagnolli et al., J. Immunol. 145:1706-1712, 1990; Bertagnolli et al., Cellular Immunology 133:327-341, 1991; Bertagnolli, et al., I. Immunol. 149:3778-3783, 1992; Bowman et al., I. Immunol. 152:1756-1761, 1994.

Assays for cytokine production and/or proliferation of spleen cells, lymph node cells or
35 thymocytes include, without limitation, those described in: Polyclonal T cell stimulation,

Kruisbeek, A. M. and Shevach, E. M. In Current Protocols in Immunology. J. E. e.a. Coligan eds. Vol 1 pp. 3.12.1-3.12.14, John Wiley and Sons, Toronto. 1994; and Measurement of mouse and human interleukin- γ , Schreiber, R. D. In Current Protocols in Immunology. J. E. e.a. Coligan eds. Vol 1 pp. 6.8.1-6.8.8, John Wiley and Sons, Toronto. 1994.

- 5 Assays for proliferation and differentiation of hematopoietic and lymphopoietic cells include, without limitation, those described in: Measurement of Human and Murine Interleukin 2 and Interleukin 4, Bottomly, K., Davis, L. S. and Lipsky, P. E. In Current Protocols in Immunology. J. E. e.a. Coligan eds. Vol 1 pp. 6.3.1-6.3.12, John Wiley and Sons, Toronto. 1991; deVries et al., J. Exp. Med. 173:1205-1211, 1991; Moreau et al., Nature 336:690-692, 1988;
- 10 Greenberger et al., Proc. Natl. Acad. Sci. U.S.A. 80:2931-2938, 1983; Measurement of mouse and human interleukin 6--Nordan, R. In Current Protocols in Immunology. J. E. Coligan eds. Vol 1 pp. 6.6.1-6.6.5, John Wiley and Sons, Toronto. 1991; Smith et al., Proc. Natl. Acad. Sci. U.S.A. 83:1857-1861, 1986; Measurement of human Interleukin 11--Bennett, F., Giannotti, J., Clark, S. C. and Turner, K. J. In Current Protocols in Immunology. J. E. Coligan eds. Vol 1 pp.
- 15 6.15.1 John Wiley and Sons, Toronto. 1991; Measurement of mouse and human Interleukin 9--Ciarletta, A., Giannotti, J., Clark, S. C. and Turner, K. J. In Current Protocols in Immunology. J. E. Coligan eds. Vol 1 pp. 6.13.1, John Wiley and Sons, Toronto. 1991.

- Assays for T-cell clone responses to antigens (which will identify, among others, proteins that affect APC-T cell interactions as well as direct T-cell effects by measuring proliferation and
- 20 cytokine production) include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, *In Vitro* assays for Mouse Lymphocyte Function; Chapter 6, Cytokines and their cellular receptors; Chapter 7, Immunologic studies in Humans); Weinberger et al., Proc. Natl. Acad. Sci. USA 77:6091-6095,
- 25 1980; Weinberger et al., Eur. J. Immun. 11:405-411, 1981; Takai et al., J. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988.

3.10.4 STEM CELL GROWTH FACTOR ACTIVITY

- A polypeptide of the present invention may exhibit stem cell growth factor activity and
- 30 be involved in the proliferation, differentiation and survival of pluripotent and totipotent stem cells including primordial germ cells, embryonic stem cells, hematopoietic stem cells and/or germ line stem cells. Administration of the polypeptide of the invention to stem cells *in vivo* or *ex vivo* is expected to maintain and expand cell populations in a totipotent or pluripotent state which would be useful for re-engineering damaged or diseased tissues, transplantation,
- 35 manufacture of bio-pharmaceuticals and the development of bio-sensors. The ability to produce

large quantities of human cells has important working applications for the production of human proteins which currently must be obtained from non-human sources or donors, implantation of cells to treat diseases such as Parkinson's, Alzheimer's and other neurodegenerative diseases; tissues for grafting such as bone marrow, skin, cartilage, tendons, bone, muscle (including
5 cardiac muscle), blood vessels, cornea, neural cells, gastrointestinal cells and others; and organs for transplantation such as kidney, liver, pancreas (including islet cells), heart and lung.

It is contemplated that multiple different exogenous growth factors and/or cytokines may be administered in combination with the polypeptide of the invention to achieve the desired effect, including any of the growth factors listed herein, other stem cell maintenance factors, and
10 specifically including stem cell factor (SCF), leukemia inhibitory factor (LIF), Flt-3 ligand (Flt-3L), any of the interleukins, recombinant soluble IL-6 receptor fused to IL-6, bone marrow inflammatory protein 1-alpha (MIP-1-alpha), G-CSF, GM-CSF, thrombopoietin (TPO), platelet factor 4 (PF-4), platelet-derived growth factor (PDGF), neural growth factors and basic fibroblast growth factor (bFGF).

15 Since totipotent stem cells can give rise to virtually any mature cell type, expansion of these cells in culture will facilitate the production of large quantities of mature cells. Techniques for culturing stem cells are known in the art and administration of polypeptides of the invention, optionally with other growth factors and/or cytokines, is expected to enhance the survival and proliferation of the stem cell populations. This can be accomplished by direct administration of
20 the polypeptide of the invention to the culture medium. Alternatively, stroma cells transfected with a polynucleotide that encodes for the polypeptide of the invention can be used as a feeder layer for the stem cell populations in culture or in vivo. Stromal support cells for feeder layers may include embryonic bone marrow fibroblasts, bone marrow stromal cells, fetal liver cells, or cultured embryonic fibroblasts (see U.S. Patent No. 5,690,926).

25 Stem cells themselves can be transfected with a polynucleotide of the invention to induce autocrine expression of the polypeptide of the invention. This will allow for generation of undifferentiated totipotent/pluripotent stem cell lines that are useful as is or that can then be differentiated into the desired mature cell types. These stable cell lines can also serve as a source of undifferentiated totipotent/pluripotent mRNA to create cDNA libraries and templates for
30 polymerase chain reaction experiments. These studies would allow for the isolation and identification of differentially expressed genes in stem cell populations that regulate stem cell proliferation and/or maintenance.

Expansion and maintenance of totipotent stem cell populations will be useful in the treatment of many pathological conditions. For example, polypeptides of the present invention
35 may be used to manipulate stem cells in culture to give rise to neuroepithelial cells that can be

used to augment or replace cells damaged by illness, autoimmune disease, accidental damage or genetic disorders. The polypeptide of the invention may be useful for inducing the proliferation of neural cells and for the regeneration of nerve and brain tissue, i.e. for the treatment of central and peripheral nervous system diseases and neuropathies, as well as mechanical and traumatic disorders which involve degeneration, death or trauma to neural cells or nerve tissue. In addition, the expanded stem cell populations can also be genetically altered for gene therapy purposes and to decrease host rejection of replacement tissues after grafting or implantation.

Expression of the polypeptide of the invention and its effect on stem cells can also be manipulated to achieve controlled differentiation of the stem cells into more differentiated cell types. A broadly applicable method of obtaining pure populations of a specific differentiated cell type from undifferentiated stem cell populations involves the use of a cell-type specific promoter driving a selectable marker. The selectable marker allows only cells of the desired type to survive. For example, stem cells can be induced to differentiate into cardiomyocytes (Wobus et al., *Differentiation*, 48: 173-182, (1991); Klug et al., *J. Clin. Invest.*, 98(1): 216-224, (1998)) or skeletal muscle cells (Browder, L. W. In: *Principles of Tissue Engineering* eds. Lanza et al., Academic Press (1997)). Alternatively, directed differentiation of stem cells can be accomplished by culturing the stem cells in the presence of a differentiation factor such as retinoic acid and an antagonist of the polypeptide of the invention which would inhibit the effects of endogenous stem cell factor activity and allow differentiation to proceed.

In vitro cultures of stem cells can be used to determine if the polypeptide of the invention exhibits stem cell growth factor activity. Stem cells are isolated from any one of various cell sources (including hematopoietic stem cells and embryonic stem cells) and cultured on a feeder layer, as described by Thompson et al. *Proc. Natl. Acad. Sci. U.S.A.*, 92: 7844-7848 (1995), in the presence of the polypeptide of the invention alone or in combination with other growth factors or cytokines. The ability of the polypeptide of the invention to induce stem cells proliferation is determined by colony formation on semi-solid support e.g. as described by Bernstein et al., *Blood*, 77: 2316-2321 (1991).

3.10.5 HEMATOPOIESIS REGULATING ACTIVITY

A polypeptide of the present invention may be involved in regulation of hematopoiesis and, consequently, in the treatment of myeloid or lymphoid cell disorders. Even marginal biological activity in support of colony forming cells or of factor-dependent cell lines indicates involvement in regulating hematopoiesis, e.g. in supporting the growth and proliferation of erythroid progenitor cells alone or in combination with other cytokines, thereby indicating utility, for example, in treating various anemias or for use in conjunction with

irradiation/chemotherapy to stimulate the production of erythroid precursors and/or erythroid cells; in supporting the growth and proliferation of myeloid cells such as granulocytes and monocytes/bone marrows (i.e., traditional CSF activity) useful, for example, in conjunction with chemotherapy to prevent or treat consequent myelo-suppression; in supporting the growth and proliferation of megakaryocytes and consequently of platelets thereby allowing prevention or treatment of various platelet disorders such as thrombocytopenia, and generally for use in place of or complimentary to platelet transfusions; and/or in supporting the growth and proliferation of hematopoietic stem cells which are capable of maturing to any and all of the above-mentioned hematopoietic cells and therefore find therapeutic utility in various stem cell disorders (such as those usually treated with transplantation, including, without limitation, aplastic anemia and paroxysmal nocturnal hemoglobinuria), as well as in repopulating the stem cell compartment post irradiation/chemotherapy, either *in-vivo* or *ex-vivo* (i.e., in conjunction with bone marrow transplantation or with peripheral progenitor cell transplantation (homologous or heterologous)) as normal cells or genetically manipulated for gene therapy.

Therapeutic compositions of the invention can be used in the following:

Suitable assays for proliferation and differentiation of various hematopoietic lines are cited above.

Assays for embryonic stem cell differentiation (which will identify, among others, proteins that influence embryonic differentiation hematopoiesis) include, without limitation, those described in: Johansson et al. *Cellular Biology* 15:141-151, 1995; Keller et al., *Molecular and Cellular Biology* 13:473-486, 1993; McClanahan et al., *Blood* 81:2903-2915, 1993.

Assays for stem cell survival and differentiation (which will identify, among others, proteins that regulate lympho-hematopoiesis) include, without limitation, those described in: Methylcellulose colony forming assays, Freshney, M. G. In *Culture of Hematopoietic Cells*. R. I. Freshney, et al. eds. Vol pp. 265-268, Wiley-Liss, Inc., New York, N.Y. 1994; Hirayama et al., *Proc. Natl. Acad. Sci. USA* 89:5907-5911, 1992; Primitive hematopoietic colony forming cells with high proliferative potential, McNiece, I. K. and Briddell, R. A. In *Culture of Hematopoietic Cells*. R. I. Freshney, et al. eds. Vol pp. 23-39, Wiley-Liss, Inc., New York, N.Y. 1994; Neben et al., *Experimental Hematology* 22:353-359, 1994; Cobblestone area forming cell assay, Ploemacher, R. E. In *Culture of Hematopoietic Cells*. R. I. Freshney, et al. eds. Vol pp. 1-21, Wiley-Liss, Inc., New York, N.Y. 1994; Long term bone marrow cultures in the presence of stromal cells, Spooncer, E., Dexter, M. and Allen, T. In *Culture of Hematopoietic Cells*. R. I. Freshney, et al. eds. Vol pp. 163-179, Wiley-Liss, Inc., New York, N.Y. 1994; Long term culture initiating cell assay, Sutherland, H. J. In *Culture of Hematopoietic Cells*. R. I. Freshney, et al. eds. Vol pp. 139-162, Wiley-Liss, Inc., New York, N.Y. 1994.

3.10.6 TISSUE GROWTH ACTIVITY

A polypeptide of the present invention also may be involved in bone, cartilage, tendon, ligament and/or nerve tissue growth or regeneration, as well as in wound healing and tissue
5 repair and replacement, and in healing of burns, incisions and ulcers.

A polypeptide of the present invention that induces cartilage and/or bone growth in circumstances where bone is not normally formed has application in the healing of bone fractures and cartilage damage or defects in humans and other animals. Compositions of a polypeptide, antibody, binding partner, or other modulator of the invention may have prophylactic use in
10 closed as well as open fracture reduction and also in the improved fixation of artificial joints. De novo bone formation induced by an osteogenic agent contributes to the repair of congenital, trauma induced, or oncologic resection induced craniofacial defects, and also is useful in cosmetic plastic surgery.

A polypeptide of this invention may also be involved in attracting bone-forming cells,
15 stimulating growth of bone-forming cells, or inducing differentiation of progenitors of bone-forming cells. Treatment of osteoporosis, osteoarthritis, bone degenerative disorders, or periodontal disease, such as through stimulation of bone and/or cartilage repair or by blocking inflammation or processes of tissue destruction (collagenase activity, osteoclast activity, etc.) mediated by inflammatory processes may also be possible using the composition of the
20 invention.

Another category of tissue regeneration activity that may involve the polypeptide of the present invention is tendon/ligament formation. Induction of tendon/ligament-like tissue or other tissue formation in circumstances where such tissue is not normally formed, has application in the healing of tendon or ligament tears, deformities and other tendon or ligament defects in
25 humans and other animals. Such a preparation employing a tendon/ligament-like tissue inducing protein may have prophylactic use in preventing damage to tendon or ligament tissue, as well as use in the improved fixation of tendon or ligament to bone or other tissues, and in repairing defects to tendon or ligament tissue. De novo tendon/ligament-like tissue formation induced by a composition of the present invention contributes to the repair of congenital, trauma induced, or
30 other tendon or ligament defects of other origin, and is also useful in cosmetic plastic surgery for attachment or repair of tendons or ligaments. The compositions of the present invention may provide environment to attract tendon- or ligament-forming cells, stimulate growth of tendon- or ligament-forming cells, induce differentiation of progenitors of tendon- or ligament-forming cells, or induce growth of tendon/ligament cells or progenitors *ex vivo* for return *in vivo* to effect
35 tissue repair. The compositions of the invention may also be useful in the treatment of

tendonitis, carpal tunnel syndrome and other tendon or ligament defects. The compositions may also include an appropriate matrix and/or sequestering agent as a carrier as is well known in the art.

The compositions of the present invention may also be useful for proliferation of neural cells and for regeneration of nerve and brain tissue, i.e. for the treatment of central and peripheral nervous system diseases and neuropathies, as well as mechanical and traumatic disorders, which involve degeneration, death or trauma to neural cells or nerve tissue. More specifically, a composition may be used in the treatment of diseases of the peripheral nervous system, such as peripheral nerve injuries, peripheral neuropathy and localized neuropathies, and central nervous system diseases, such as Alzheimer's, Parkinson's disease, Huntington's disease, amyotrophic lateral sclerosis, and Shy-Drager syndrome. Further, conditions that may be treated in accordance with the present invention include mechanical and traumatic disorders, such as spinal cord disorders, head trauma and cerebrovascular diseases such as stroke. Peripheral neuropathies resulting from chemotherapy or other medical therapies may also be treatable using a composition of the invention.

Compositions of the invention may also be useful to promote better or faster closure of non-healing wounds, including without limitation pressure ulcers, ulcers associated with vascular insufficiency, surgical and traumatic wounds, and the like.

Compositions of the present invention may also be involved in the generation or regeneration of other tissues, such as organs (including, for example, pancreas, liver, intestine, kidney, skin, endothelium), muscle (smooth, skeletal or cardiac) and vascular (including vascular endothelium) tissue, or for promoting the growth of cells comprising such tissues. Part of the desired effects may be by inhibition or modulation of fibrotic scarring may allow normal tissue to regenerate. A polypeptide of the present invention may also exhibit angiogenic activity.

A composition of the present invention may also be useful for gut protection or regeneration and treatment of lung or liver fibrosis, reperfusion injury in various tissues, and conditions resulting from systemic cytokine damage.

A composition of the present invention may also be useful for promoting or inhibiting differentiation of tissues described above from precursor tissues or cells; or for inhibiting the growth of tissues described above.

Therapeutic compositions of the invention can be used in the following:

Assays for tissue generation activity include, without limitation, those described in: International Patent Publication No. WO95/16035 (bone, cartilage, tendon); International Patent Publication No. WO95/05846 (nerve, neuronal); International Patent Publication No. WO91/07491 (skin, endothelium).

Assays for wound healing activity include, without limitation, those described in: Winter, Epidermal Wound Healing, pps. 71-112 (Maibach, H. I. and Rovee, D. T., eds.), Year Book Medical Publishers, Inc., Chicago, as modified by Eaglstein and Mertz, J. Invest. Dermatol 71:382-84 (1978).

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3.10.7 IMMUNE STIMULATING OR SUPPRESSING ACTIVITY

A polypeptide of the present invention may also exhibit immune stimulating or immune suppressing activity, including without limitation the activities for which assays are described herein. A polynucleotide of the invention can encode a polypeptide exhibiting such activities. A protein may be useful in the treatment of various immune deficiencies and disorders (including severe combined immunodeficiency (SCID)), e.g., in regulating (up or down) growth and proliferation of T and/or B lymphocytes, as well as effecting the cytolytic activity of NK cells and other cell populations. These immune deficiencies may be genetic or be caused by viral (e.g., HIV) as well as bacterial or fungal infections, or may result from autoimmune disorders. More specifically, infectious diseases caused by viral, bacterial, fungal or other infection may be treatable using a protein of the present invention, including infections by HIV, hepatitis viruses, herpes viruses, mycobacteria, Leishmania spp., malaria spp. and various fungal infections such as candidiasis. Of course, in this regard, proteins of the present invention may also be useful where a boost to the immune system generally may be desirable, i.e., in the treatment of cancer.

Autoimmune disorders that may be treated using a protein of the present invention include, for example, connective tissue disease, multiple sclerosis, systemic lupus erythematosus, rheumatoid arthritis, autoimmune pulmonary inflammation, Guillain-Barre syndrome, autoimmune thyroiditis, insulin dependent diabetes mellitus, myasthenia gravis, graft-versus-host disease and autoimmune inflammatory eye disease. Such a protein (or antagonists thereof, including antibodies) of the present invention may also be useful in the treatment of allergic reactions and conditions (e.g., anaphylaxis, serum sickness, drug reactions, food allergies, insect venom allergies, mastocytosis, allergic rhinitis, hypersensitivity pneumonitis, urticaria, angioedema, eczema, atopic dermatitis, allergic contact dermatitis, erythema multiforme, Stevens-Johnson syndrome, allergic conjunctivitis, atopic keratoconjunctivitis, venereal keratoconjunctivitis, giant papillary conjunctivitis and contact allergies), such as asthma (particularly allergic asthma) or other respiratory problems. Other conditions, in which immune suppression is desired (including, for example, organ transplantation), may also be treatable using a protein (or antagonists thereof) of the present invention. The therapeutic effects of the polypeptides or antagonists thereof on allergic reactions can be evaluated by in vivo animals models such as the cumulative contact enhancement test (Lastbom et al., Toxicology 125: 59-66,

1998), skin prick test (Hoffmann et al., Allergy 54: 446-54, 1999), guinea pig skin sensitization test (Vohr et al., Arch. Toxicol. 73: 501-9), and murine local lymph node assay (Kimber et al., J. Toxicol. Environ. Health 53: 563-79).

Using the proteins of the invention it may also be possible to modulate immune responses, in a number of ways. Down regulation may be in the form of inhibiting or blocking an immune response already in progress or may involve preventing the induction of an immune response. The functions of activated T cells may be inhibited by suppressing T cell responses or by inducing specific tolerance in T cells, or both. Immunosuppression of T cell responses is generally an active, non-antigen-specific, process that requires continuous exposure of the T cells to the suppressive agent. Tolerance, which involves inducing non-responsiveness or anergy in T cells, is distinguishable from immunosuppression in that it is generally antigen-specific and persists after exposure to the tolerizing agent has ceased. Operationally, tolerance can be demonstrated by the lack of a T cell response upon reexposure to specific antigen in the absence of the tolerizing agent.

Down regulating or preventing one or more antigen functions (including without limitation B lymphocyte antigen functions (such as, for example, B7)), e.g., preventing high level lymphokine synthesis by activated T cells, will be useful in situations of tissue, skin and organ transplantation and in graft-versus-host disease (GVHD). For example, blockage of T cell function should result in reduced tissue destruction in tissue transplantation. Typically, in tissue transplants, rejection of the transplant is initiated through its recognition as foreign by T cells, followed by an immune reaction that destroys the transplant. The administration of a therapeutic composition of the invention may prevent cytokine synthesis by immune cells, such as T cells, and thus acts as an immunosuppressant. Moreover, a lack of costimulation may also be sufficient to anergize the T cells, thereby inducing tolerance in a subject. Induction of long-term tolerance by B lymphocyte antigen-blocking reagents may avoid the necessity of repeated administration of these blocking reagents. To achieve sufficient immunosuppression or tolerance in a subject, it may also be necessary to block the function of a combination of B lymphocyte antigens.

The efficacy of particular therapeutic compositions in preventing organ transplant rejection or GVHD can be assessed using animal models that are predictive of efficacy in humans. Examples of appropriate systems which can be used include allogeneic cardiac grafts in rats and xenogeneic pancreatic islet cell grafts in mice, both of which have been used to examine the immunosuppressive effects of CTLA4Ig fusion proteins in vivo as described in Lenschow et al., Science 257:789-792 (1992) and Turka et al., Proc. Natl. Acad. Sci USA, 89:11102-11105 (1992). In addition, murine models of GVHD (see Paul ed., Fundamental Immunology, Raven

Press, New York, 1989, pp. 846-847) can be used to determine the effect of therapeutic compositions of the invention on the development of that disease.

Blocking antigen function may also be therapeutically useful for treating autoimmune diseases. Many autoimmune disorders are the result of inappropriate activation of T cells that are reactive against self-tissue and which promote the production of cytokines and autoantibodies involved in the pathology of the diseases. Preventing the activation of auto-reactive T cells may reduce or eliminate disease symptoms. Administration of reagents which block stimulation of T cells can be used to inhibit T cell activation and prevent production of autoantibodies or T cell-derived cytokines which may be involved in the disease process. Additionally, blocking reagents may induce antigen-specific tolerance of auto-reactive T cells which could lead to long-term relief from the disease. The efficacy of blocking reagents in preventing or alleviating autoimmune disorders can be determined using a number of well-characterized animal models of human autoimmune diseases. Examples include murine experimental autoimmune encephalitis, systemic lupus erythematosus in MRL/lpr/lpr mice or NZB hybrid mice, murine autoimmune collagen arthritis, diabetes mellitus in NOD mice and BB rats, and murine experimental myasthenia gravis (see Paul ed., *Fundamental Immunology*, Raven Press, New York, 1989, pp. 840-856).

Upregulation of an antigen function (e.g., a B lymphocyte antigen function), as a means of up regulating immune responses, may also be useful in therapy. Upregulation of immune responses may be in the form of enhancing an existing immune response or eliciting an initial immune response. For example, enhancing an immune response may be useful in cases of viral infection, including systemic viral diseases such as influenza, the common cold, and encephalitis.

Alternatively, anti-viral immune responses may be enhanced in an infected patient by removing T cells from the patient, costimulating the T cells in vitro with viral antigen-pulsed APCs either expressing a peptide of the present invention or together with a stimulatory form of a soluble peptide of the present invention and reintroducing the in vitro activated T cells into the patient. Another method of enhancing anti-viral immune responses would be to isolate infected cells from a patient, transfect them with a nucleic acid encoding a protein of the present invention as described herein such that the cells express all or a portion of the protein on their surface, and reintroduce the transfected cells into the patient. The infected cells would now be capable of delivering a costimulatory signal to, and thereby activate, T cells in vivo.

A polypeptide of the present invention may provide the necessary stimulation signal to T cells to induce a T cell mediated immune response against the transfected tumor cells. In addition, tumor cells which lack MHC class I or MHC class II molecules, or which fail to

reexpress sufficient mounts of MHC class I or MHC class II molecules, can be transfected with nucleic acid encoding all or a portion of (e.g., a cytoplasmic-domain truncated portion) of an MHC class I alpha chain protein and β_2 microglobulin protein or an MHC class II alpha chain protein and an MHC class II beta chain protein to thereby express MHC class I or MHC class II proteins on the cell surface. Expression of the appropriate class I or class II MHC in conjunction with a peptide having the activity of a B lymphocyte antigen (e.g., B7-1, B7-2, B7-3) induces a T cell mediated immune response against the transfected tumor cell. Optionally, a gene encoding an antisense construct which blocks expression of an MHC class II associated protein, such as the invariant chain, can also be cotransfected with a DNA encoding a peptide having the activity of a B lymphocyte antigen to promote presentation of tumor associated antigens and induce tumor specific immunity. Thus, the induction of a T cell mediated immune response in a human subject may be sufficient to overcome tumor-specific tolerance in the subject.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Suitable assays for thymocyte or splenocyte cytotoxicity include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Herrmann et al., Proc. Natl. Acad. Sci. USA 78:2488-2492, 1981; Herrmann et al., J. Immunol. 128:1968-1974, 1982; Handa et al., J. Immunol. 135:1564-1572, 1985; Takai et al., I. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988; Bowman et al., J. Virology 61:1992-1998; Bertagnolli et al., Cellular Immunology 133:327-341, 1991; Brown et al., J. Immunol. 153:3079-3092, 1994.

Assays for T-cell-dependent immunoglobulin responses and isotype switching (which will identify, among others, proteins that modulate T-cell dependent antibody responses and that affect Th1/Th2 profiles) include, without limitation, those described in: Maliszewski, J. Immunol. 144:3028-3033, 1990; and Assays for B cell function: In vitro antibody production, Mond, J. J. and Brunswick, M. In Current Protocols in Immunology. J. E. e.a. Coligan eds. Vol 1 pp. 3.8.1-3.8.16, John Wiley and Sons, Toronto. 1994.

Mixed lymphocyte reaction (MLR) assays (which will identify, among others, proteins that generate predominantly Th1 and CTL responses) include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in

Humans); Takai et al., J. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988; Bertagnolli et al., J. Immunol. 149:3778-3783, 1992.

Dendritic cell-dependent assays (which will identify, among others, proteins expressed by dendritic cells that activate naive T-cells) include, without limitation, those described in:

- 5 Guery et al., J. Immunol. 134:536-544, 1995; Inaba et al., Journal of Experimental Medicine 173:549-559, 1991; Macatonia et al., Journal of Immunology 154:5071-5079, 1995; Porgador et al., Journal of Experimental Medicine 182:255-260, 1995; Nair et al., Journal of Virology 67:4062-4069, 1993; Huang et al., Science 264:961-965, 1994; Macatonia et al., Journal of Experimental Medicine 169:1255-1264, 1989; Bhardwaj et al., Journal of Clinical Investigation
10 94:797-807, 1994; and Inaba et al., Journal of Experimental Medicine 172:631-640, 1990.

- Assays for lymphocyte survival/apoptosis (which will identify, among others, proteins that prevent apoptosis after superantigen induction and proteins that regulate lymphocyte homeostasis) include, without limitation, those described in: Darzynkiewicz et al., Cytometry 13:795-808, 1992; Gorczyca et al., Leukemia 7:659-670, 1993; Gorczyca et al., Cancer Research
15 53:1945-1951, 1993; Itoh et al., Cell 66:233-243, 1991; Zacharchuk, Journal of Immunology 145:4037-4045, 1990; Zamai et al., Cytometry 14:891-897, 1993; Gorczyca et al., International Journal of Oncology 1:639-648, 1992.

- Assays for proteins that influence early steps of T-cell commitment and development include, without limitation, those described in: Antica et al., Blood 84:111-117, 1994; Fine et al., Cellular Immunology 155:111-122, 1994; Galy et al., Blood 85:2770-2778, 1995; Toki et al.,
20 Proc. Nat. Acad. Sci. USA 88:7548-7551, 1991.

3.10.8 ACTIVIN/INHIBIN ACTIVITY

- A polypeptide of the present invention may also exhibit activin- or inhibin-related
25 activities. A polynucleotide of the invention may encode a polypeptide exhibiting such characteristics. Inhibins are characterized by their ability to inhibit the release of follicle stimulating hormone (FSH), while activins are characterized by their ability to stimulate the release of follicle stimulating hormone (FSH). Thus, a polypeptide of the present invention, alone or in heterodimers with a member of the inhibin family, may be useful as a contraceptive
30 based on the ability of inhibins to decrease fertility in female mammals and decrease spermatogenesis in male mammals. Administration of sufficient amounts of other inhibins can induce infertility in these mammals. Alternatively, the polypeptide of the invention, as a homodimer or as a heterodimer with other protein subunits of the inhibin group, may be useful as a fertility inducing therapeutic, based upon the ability of activin molecules in stimulating FSH
35 release from cells of the anterior pituitary. See, for example, U.S. Pat. No. 4,798,885. A

polypeptide of the invention may also be useful for advancement of the onset of fertility in sexually immature mammals, so as to increase the lifetime reproductive performance of domestic animals such as, but not limited to, cows, sheep and pigs.

5 The activity of a polypeptide of the invention may, among other means, be measured by the following methods.

Assays for activin/inhibin activity include, without limitation, those described in: Vale et al., *Endocrinology* 91:562-572, 1972; Ling et al., *Nature* 321:779-782, 1986; Vale et al., *Nature* 321:776-779, 1986; Mason et al., *Nature* 318:659-663, 1985; Forage et al., *Proc. Natl. Acad. Sci. USA* 83:3091-3095, 1986.

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3.10.9 CHEMOTACTIC/CHEMOKINETIC ACTIVITY

A polypeptide of the present invention may be involved in chemotactic or chemokinetic activity for mammalian cells, including, for example, monocytes, fibroblasts, neutrophils, T-cells, mast cells, eosinophils, epithelial and/or endothelial cells. A polynucleotide of the invention can encode a polypeptide exhibiting such attributes. Chemotactic and chemokinetic receptor activation can be used to mobilize or attract a desired cell population to a desired site of action. Chemotactic or chemokinetic compositions (e.g. proteins, antibodies, binding partners, or modulators of the invention) provide particular advantages in treatment of wounds and other trauma to tissues, as well as in treatment of localized infections. For example, attraction of lymphocytes, monocytes or neutrophils to tumors or sites of infection may result in improved immune responses against the tumor or infecting agent.

A protein or peptide has chemotactic activity for a particular cell population if it can stimulate, directly or indirectly, the directed orientation or movement of such cell population. Preferably, the protein or peptide has the ability to directly stimulate directed movement of cells. Whether a particular protein has chemotactic activity for a population of cells can be readily determined by employing such protein or peptide in any known assay for cell chemotaxis.

25 Therapeutic compositions of the invention can be used in the following:

Assays for chemotactic activity (which will identify proteins that induce or prevent chemotaxis) consist of assays that measure the ability of a protein to induce the migration of cells across a membrane as well as the ability of a protein to induce the adhesion of one cell population to another cell population. Suitable assays for movement and adhesion include, without limitation, those described in: *Current Protocols in Immunology*, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margules, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 6.12, Measurement of alpha and beta Chemokines 6.12.1-6.12.28; Taub et al. *J. Clin. Invest.* 95:1370-1376, 1995; Lind et al. *APMIS* 103:140-146,

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1995; Muller et al Eur. J. Immunol. 25:1744-1748; Gruber et al. J. of Immunol. 152:5860-5867, 1994; Johnston et al. J. of Immunol. 153:1762-1768, 1994.

3.10.10 HEMOSTATIC AND THROMBOLYTIC ACTIVITY

5 A polypeptide of the invention may also be involved in hemostasis or thrombolysis or thrombosis. A polynucleotide of the invention can encode a polypeptide exhibiting such attributes. Compositions may be useful in treatment of various coagulation disorders (including hereditary disorders, such as hemophilias) or to enhance coagulation and other hemostatic events in treating wounds resulting from trauma, surgery or other causes. A composition of the
10 invention may also be useful for dissolving or inhibiting formation of thromboses and for treatment and prevention of conditions resulting therefrom (such as, for example, infarction of cardiac and central nervous system vessels (e.g., stroke)).

Therapeutic compositions of the invention can be used in the following:

Assay for hemostatic and thrombolytic activity include, without limitation, those
15 described in: Linet et al., J. Clin. Pharmacol. 26:131-140, 1986; Burdick et al., Thrombosis Res. 45:413-419, 1987; Humphrey et al., Fibrinolysis 5:71-79 (1991); Schaub, Prostaglandins 35:467-474, 1988.

3.10.11 CANCER DIAGNOSIS AND THERAPY

20 Polypeptides of the invention may be involved in cancer cell generation, proliferation or metastasis. Detection of the presence or amount of polynucleotides or polypeptides of the invention may be useful for the diagnosis and/or prognosis of one or more types of cancer. For example, the presence or increased expression of a polynucleotide/polypeptide of the invention may indicate a hereditary risk of cancer, a precancerous condition, or an ongoing malignancy.
25 Conversely, a defect in the gene or absence of the polypeptide may be associated with a cancer condition. Identification of single nucleotide polymorphisms associated with cancer or a predisposition to cancer may also be useful for diagnosis or prognosis.

Cancer treatments promote tumor regression by inhibiting tumor cell proliferation, inhibiting angiogenesis (growth of new blood vessels that is necessary to support tumor growth)
30 and/or prohibiting metastasis by reducing tumor cell motility or invasiveness. Therapeutic compositions of the invention may be effective in adult and pediatric oncology including in solid phase tumors/malignancies, locally advanced tumors, human soft tissue sarcomas, metastatic cancer, including lymphatic metastases, blood cell malignancies including multiple myeloma, acute and chronic leukemias, and lymphomas, head and neck cancers including mouth cancer,
35 larynx cancer and thyroid cancer, lung cancers including small cell carcinoma and non-small cell

cancers, breast cancers including small cell carcinoma and ductal carcinoma, gastrointestinal cancers including esophageal cancer, stomach cancer, colon cancer, colorectal cancer and polyps associated with colorectal neoplasia, pancreatic cancers, liver cancer, urologic cancers including bladder cancer and prostate cancer, malignancies of the female genital tract including ovarian carcinoma, uterine (including endometrial) cancers, and solid tumor in the ovarian follicle, kidney cancers including renal cell carcinoma, brain cancers including intrinsic brain tumors, neuroblastoma, astrocytic brain tumors, gliomas, metastatic tumor cell invasion in the central nervous system, bone cancers including osteomas, skin cancers including malignant melanoma, tumor progression of human skin keratinocytes, squamous cell carcinoma, basal cell carcinoma, hemangiopericytoma and Kaposi's sarcoma.

Polypeptides, polynucleotides, or modulators of polypeptides of the invention (including inhibitors and stimulators of the biological activity of the polypeptide of the invention) may be administered to treat cancer. Therapeutic compositions can be administered in therapeutically effective dosages alone or in combination with adjuvant cancer therapy such as surgery, chemotherapy, radiotherapy, thermotherapy, and laser therapy, and may provide a beneficial effect, e.g. reducing tumor size, slowing rate of tumor growth, inhibiting metastasis, or otherwise improving overall clinical condition, without necessarily eradicating the cancer.

The composition can also be administered in therapeutically effective amounts as a portion of an anti-cancer cocktail. An anti-cancer cocktail is a mixture of the polypeptide or modulator of the invention with one or more anti-cancer drugs in addition to a pharmaceutically acceptable carrier for delivery. The use of anti-cancer cocktails as a cancer treatment is routine. Anti-cancer drugs that are well known in the art and can be used as a treatment in combination with the polypeptide or modulator of the invention include: Actinomycin D, Aminoglutethimide, Asparaginase, Bleomycin, Busulfan, Carboplatin, Carmustine, Chlorambucil, Cisplatin (cis-DDP), Cyclophosphamide, Cytarabine HCl (Cytosine arabinoside), Dacarbazine, Dactinomycin, Daunorubicin HCl, Doxorubicin HCl, Estramustine phosphate sodium, Etoposide (V16-213), Floxuridine, 5-Fluorouracil (5-Fu), Flutamide, Hydroxyurea (hydroxycarbamide), Ifosfamide, Interferon Alpha-2a, Interferon Alpha-2b, Leuprolide acetate (LHRH-releasing factor analog), Lomustine, Mechlorethamine HCl (nitrogen mustard), Melphalan, Mercaptopurine, Mesna, Methotrexate (MTX), Mitomycin, Mitoxantrone HCl, Octreotide, Plicamycin, Procarbazine HCl, Streptozocin, Tamoxifen citrate, Thioguanine, Thiotepa, Vinblastine sulfate, Vincristine sulfate, Amsacrine, Azacitidine, Hexamethylmelamine, Interleukin-2, Mitoguazone, Pentostatin, Semustine, Teniposide, and Vindesine sulfate.

In addition, therapeutic compositions of the invention may be used for prophylactic treatment of cancer. There are hereditary conditions and/or environmental situations (e.g.

exposure to carcinogens) known in the art that predispose an individual to developing cancers. Under these circumstances, it may be beneficial to treat these individuals with therapeutically effective doses of the polypeptide of the invention to reduce the risk of developing cancers.

In vitro models can be used to determine the effective doses of the polypeptide of the invention as a potential cancer treatment. These *in vitro* models include proliferation assays of cultured tumor cells, growth of cultured tumor cells in soft agar (see Freshney, (1987) Culture of Animal Cells: A Manual of Basic Technique, Wiley-Liss, New York, NY Ch 18 and Ch 21), tumor systems in nude mice as described in Giovanella et al., J. Natl. Can. Inst., 52: 921-30 (1974), mobility and invasive potential of tumor cells in Boyden Chamber assays as described in Pilkington et al., Anticancer Res., 17: 4107-9 (1997), and angiogenesis assays such as induction of vascularization of the chick chorioallantoic membrane or induction of vascular endothelial cell migration as described in Ribatta et al., Intl. J. Dev. Biol., 40: 1189-97 (1999) and Li et al., Clin. Exp. Metastasis, 17:423-9 (1999), respectively. Suitable tumor cells lines are available, e.g. from American Type Tissue Culture Collection catalogs.

3.10.12 RECEPTOR/LIGAND ACTIVITY

A polypeptide of the present invention may also demonstrate activity as receptor, receptor ligand or inhibitor or agonist of receptor/ligand interactions. A polynucleotide of the invention can encode a polypeptide exhibiting such characteristics. Examples of such receptors and ligands include, without limitation, cytokine receptors and their ligands, receptor kinases and their ligands, receptor phosphatases and their ligands, receptors involved in cell-cell interactions and their ligands (including without limitation, cellular adhesion molecules (such as selectins, integrins and their ligands) and receptor/ligand pairs involved in antigen presentation, antigen recognition and development of cellular and humoral immune responses. Receptors and ligands are also useful for screening of potential peptide or small molecule inhibitors of the relevant receptor/ligand interaction. A protein of the present invention (including, without limitation, fragments of receptors and ligands) may themselves be useful as inhibitors of receptor/ligand interactions.

The activity of a polypeptide of the invention may, among other means, be measured by the following methods:

Suitable assays for receptor-ligand activity include without limitation those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A. M. Kruisbeek, D. H. Margulies, E. M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley- Interscience (Chapter 7.28, Measurement of Cellular Adhesion under static conditions 7.28.1- 7.28.22), Takai et al., Proc. Natl. Acad. Sci. USA 84:6864-6868, 1987; Bierer et al., J. Exp. Med. 168:1145-1156, 1988;

Rosenstein et al., J. Exp. Med. 169:149-160 1989; Stoltenborg et al., J. Immunol. Methods 175:59-68, 1994; Stitt et al., Cell 80:661-670, 1995.

By way of example, the polypeptides of the invention may be used as a receptor for a ligand(s) thereby transmitting the biological activity of that ligand(s). Ligands may be identified
5 through binding assays, affinity chromatography, dihybrid screening assays, BIAcore assays, gel overlay assays, or other methods known in the art.

Studies characterizing drugs or proteins as agonist or antagonist or partial agonists or a partial antagonist require the use of other proteins as competing ligands. The polypeptides of the present invention or ligand(s) thereof may be labeled by being coupled to radioisotopes,
10 colorimetric molecules or toxin molecules by conventional methods. ("Guide to Protein Purification" Murray P. Deutscher (ed) Methods in Enzymology Vol. 182 (1990) Academic Press, Inc. San Diego). Examples of radioisotopes include, but are not limited to, tritium and carbon-14. Examples of colorimetric molecules include, but are not limited to, fluorescent molecules such as fluorescamine, or rhodamine or other colorimetric molecules. Examples of
15 toxins include, but are not limited, to ricin.

3.10.13 DRUG SCREENING

This invention is particularly useful for screening chemical compounds by using the novel polypeptides or binding fragments thereof in any of a variety of drug screening techniques.
20 The polypeptides or fragments employed in such a test may either be free in solution, affixed to a solid support, borne on a cell surface or located intracellularly. One method of drug screening utilizes eukaryotic or prokaryotic host cells which are stably transformed with recombinant nucleic acids expressing the polypeptide or a fragment thereof. Drugs are screened against such transformed cells in competitive binding assays. Such cells, either in viable or fixed form, can
25 be used for standard binding assays. One may measure, for example, the formation of complexes between polypeptides of the invention or fragments and the agent being tested or examine the diminution in complex formation between the novel polypeptides and an appropriate cell line, which are well known in the art.

Sources for test compounds that may be screened for ability to bind to or modulate (i.e.,
30 increase or decrease) the activity of polypeptides of the invention include (1) inorganic and organic chemical libraries, (2) natural product libraries, and (3) combinatorial libraries comprised of either random or mimetic peptides, oligonucleotides or organic molecules.

Chemical libraries may be readily synthesized or purchased from a number of commercial sources, and may include structural analogs of known compounds or compounds
35 that are identified as "hits" or "leads" via natural product screening.

The sources of natural product libraries are microorganisms (including bacteria and fungi), animals, plants or other vegetation, or marine organisms, and libraries of mixtures for screening may be created by: (1) fermentation and extraction of broths from soil, plant or marine microorganisms or (2) extraction of the organisms themselves. Natural product libraries include
5 polyketides, non-ribosomal peptides, and (non-naturally occurring) variants thereof. For a review, see *Science* 282:63-68 (1998).

Combinatorial libraries are composed of large numbers of peptides, oligonucleotides or organic compounds and can be readily prepared by traditional automated synthesis methods, PCR, cloning or proprietary synthetic methods. Of particular interest are peptide and
10 oligonucleotide combinatorial libraries. Still other libraries of interest include peptide, protein, peptidomimetic, multiparallel synthetic collection, recombinatorial, and polypeptide libraries. For a review of combinatorial chemistry and libraries created therefrom, see Myers, *Curr. Opin. Biotechnol.* 8:701-707 (1997). For reviews and examples of peptidomimetic libraries, see Al-Obeidi et al., *Mol. Biotechnol.*, 9(3):205-23 (1998); Hruby et al., *Curr Opin Chem Biol*,
15 1(1):114-19 (1997); Dorner et al., *Bioorg Med Chem*, 4(5):709-15 (1996) (alkylated dipeptides).

Identification of modulators through use of the various libraries described herein permits modification of the candidate "hit" (or "lead") to optimize the capacity of the "hit" to bind a polypeptide of the invention. The molecules identified in the binding assay are then tested for antagonist or agonist activity in *in vivo* tissue culture or animal models that are well known in the
20 art. In brief, the molecules are titrated into a plurality of cell cultures or animals and then tested for either cell/animal death or prolonged survival of the animal/cells.

The binding molecules thus identified may be complexed with toxins, e.g., ricin or cholera, or with other compounds that are toxic to cells such as radioisotopes. The toxin-binding molecule complex is then targeted to a tumor or other cell by the specificity of the binding
25 molecule for a polypeptide of the invention. Alternatively, the binding molecules may be complexed with imaging agents for targeting and imaging purposes.

3.10.14 ASSAY FOR RECEPTOR ACTIVITY

The invention also provides methods to detect specific binding of a polypeptide e.g. a
30 ligand or a receptor. The art provides numerous assays particularly useful for identifying previously unknown binding partners for receptor polypeptides of the invention. For example, expression cloning using mammalian or bacterial cells, or dihybrid screening assays can be used to identify polynucleotides encoding binding partners. As another example, affinity chromatography with the appropriate immobilized polypeptide of the invention can be used to
35 isolate polypeptides that recognize and bind polypeptides of the invention. There are a number

of different libraries used for the identification of compounds, and in particular small molecules, that modulate (*i.e.*, increase or decrease) biological activity of a polypeptide of the invention.

Ligands for receptor polypeptides of the invention can also be identified by adding exogenous ligands, or cocktails of ligands to two cells populations that are genetically identical except for the expression of the receptor of the invention: one cell population expresses the receptor of the invention whereas the other does not. The response of the two cell populations to the addition of ligand(s) is then compared. Alternatively, an expression library can be co-expressed with the polypeptide of the invention in cells and assayed for an autocrine response to identify potential ligand(s). As still another example, BIAcore assays, gel overlay assays, or other methods known in the art can be used to identify binding partner polypeptides, including, (1) organic and inorganic chemical libraries, (2) natural product libraries, and (3) combinatorial libraries comprised of random peptides, oligonucleotides or organic molecules.

The role of downstream intracellular signaling molecules in the signaling cascade of the polypeptide of the invention can be determined. For example, a chimeric protein in which the cytoplasmic domain of the polypeptide of the invention is fused to the extracellular portion of a protein, whose ligand has been identified, is produced in a host cell. The cell is then incubated with the ligand specific for the extracellular portion of the chimeric protein, thereby activating the chimeric receptor. Known downstream proteins involved in intracellular signaling can then be assayed for expected modifications *i.e.* phosphorylation. Other methods known to those in the art can also be used to identify signaling molecules involved in receptor activity.

3.10.15 ANTI-INFLAMMATORY ACTIVITY

Compositions of the present invention may also exhibit anti-inflammatory activity. The anti-inflammatory activity may be achieved by providing a stimulus to cells involved in the inflammatory response, by inhibiting or promoting cell-cell interactions (such as, for example, cell adhesion), by inhibiting or promoting chemotaxis of cells involved in the inflammatory process, inhibiting or promoting cell extravasation, or by stimulating or suppressing production of other factors which more directly inhibit or promote an inflammatory response. Compositions with such activities can be used to treat inflammatory conditions including chronic or acute conditions), including without limitation intimation associated with infection (such as septic shock, sepsis or systemic inflammatory response syndrome (SIRS)), ischemia-reperfusion injury, endotoxin lethality, arthritis, complement-mediated hyperacute rejection, nephritis, cytokine or chemokine-induced lung injury, inflammatory bowel disease, Crohn's disease or resulting from over production of cytokines such as TNF or IL-1. Compositions of the invention may also be useful to treat anaphylaxis and hypersensitivity to an antigenic substance or material.

Compositions of this invention may be utilized to prevent or treat conditions such as, but not limited to, sepsis, acute pancreatitis, endotoxin shock, cytokine induced shock, rheumatoid arthritis, chronic inflammatory arthritis, pancreatic cell damage from diabetes mellitus type 1, graft versus host disease, inflammatory bowel disease, inflammation associated with pulmonary disease, other autoimmune disease or inflammatory disease, an antiproliferative agent such as for acute or chronic myelogenous leukemia or in the prevention of premature labor secondary to intrauterine infections.

3.10.16 LEUKEMIAS

Leukemias and related disorders may be treated or prevented by administration of a therapeutic that promotes or inhibits function of the polynucleotides and/or polypeptides of the invention. Such leukemias and related disorders include but are not limited to acute leukemia, acute lymphocytic leukemia, acute myelocytic leukemia, myeloblastic, promyelocytic, myelomonocytic, monocytic, erythroleukemia, chronic leukemia, chronic myelocytic (granulocytic) leukemia and chronic lymphocytic leukemia (for a review of such disorders, see Fishman et al., 1985, Medicine, 2d Ed., J.B. Lippincott Co., Philadelphia).

3.10.17 NERVOUS SYSTEM DISORDERS

Nervous system disorders, involving cell types which can be tested for efficacy of intervention with compounds that modulate the activity of the polynucleotides and/or polypeptides of the invention, and which can be treated upon thus observing an indication of therapeutic utility, include but are not limited to nervous system injuries, and diseases or disorders which result in either a disconnection of axons, a diminution or degeneration of neurons, or demyelination. Nervous system lesions which may be treated in a patient (including human and non-human mammalian patients) according to the invention include but are not limited to the following lesions of either the central (including spinal cord, brain) or peripheral nervous systems:

- (i) traumatic lesions, including lesions caused by physical injury or associated with surgery, for example, lesions that sever a portion of the nervous system, or compression injuries;
- (ii) ischemic lesions, in which a lack of oxygen in a portion of the nervous system results in neuronal injury or death, including cerebral infarction or ischemia, or spinal cord infarction or ischemia;
- (iii) infectious lesions, in which a portion of the nervous system is destroyed or injured as a result of infection, for example, by an abscess or associated with infection by human

immunodeficiency virus, herpes zoster, or herpes simplex virus or with Lyme disease, tuberculosis, syphilis;

(iv) degenerative lesions, in which a portion of the nervous system is destroyed or injured as a result of a degenerative process including but not limited to degeneration associated with Parkinson's disease, Alzheimer's disease, Huntington's chorea, or amyotrophic lateral sclerosis;

(v) lesions associated with nutritional diseases or disorders, in which a portion of the nervous system is destroyed or injured by a nutritional disorder or disorder of metabolism including but not limited to, vitamin B12 deficiency, folic acid deficiency, Wernicke disease, tobacco-alcohol amblyopia, Marchiafava-Bignami disease (primary degeneration of the corpus callosum), and alcoholic cerebellar degeneration;

(vi) neurological lesions associated with systemic diseases including but not limited to diabetes (diabetic neuropathy, Bell's palsy), systemic lupus erythematosus, carcinoma, or sarcoidosis;

(vii) lesions caused by toxic substances including alcohol, lead, or particular neurotoxins; and

(viii) demyelinated lesions in which a portion of the nervous system is destroyed or injured by a demyelinating disease including but not limited to multiple sclerosis, human immunodeficiency virus-associated myelopathy, transverse myelopathy or various etiologies, progressive multifocal leukoencephalopathy, and central pontine myelinolysis.

Therapeutics which are useful according to the invention for treatment of a nervous system disorder may be selected by testing for biological activity in promoting the survival or differentiation of neurons. For example, and not by way of limitation, therapeutics which elicit any of the following effects may be useful according to the invention:

- (i) increased survival time of neurons in culture;
- (ii) increased sprouting of neurons in culture or *in vivo*;
- (iii) increased production of a neuron-associated molecule in culture or *in vivo*, *e.g.*, choline acetyltransferase or acetylcholinesterase with respect to motor neurons; or
- (iv) decreased symptoms of neuron dysfunction *in vivo*.

Such effects may be measured by any method known in the art. In preferred, non-limiting embodiments, increased survival of neurons may be measured by the method set forth in Arakawa et al. (1990, J. Neurosci. 10:3507-3515); increased sprouting of neurons may be detected by methods set forth in Pestronk et al. (1980, Exp. Neurol. 70:65-82) or Brown et al. (1981, Ann. Rev. Neurosci. 4:17-42); increased production of neuron-associated molecules may be measured by bioassay, enzymatic assay, antibody binding, Northern blot assay, *etc.*,

depending on the molecule to be measured; and motor neuron dysfunction may be measured by assessing the physical manifestation of motor neuron disorder, *e.g.*, weakness, motor neuron conduction velocity, or functional disability.

In specific embodiments, motor neuron disorders that may be treated according to the invention include but are not limited to disorders such as infarction, infection, exposure to toxin, trauma, surgical damage, degenerative disease or malignancy that may affect motor neurons as well as other components of the nervous system, as well as disorders that selectively affect neurons such as amyotrophic lateral sclerosis, and including but not limited to progressive spinal muscular atrophy, progressive bulbar palsy, primary lateral sclerosis, infantile and juvenile muscular atrophy, progressive bulbar paralysis of childhood (Fazio-Londe syndrome), poliomyelitis and the post polio syndrome, and Hereditary Motorsensory Neuropathy (Charcot-Marie-Tooth Disease).

3.10.18 OTHER ACTIVITIES

A polypeptide of the invention may also exhibit one or more of the following additional activities or effects: inhibiting the growth, infection or function of, or killing, infectious agents, including, without limitation, bacteria, viruses, fungi and other parasites; effecting (suppressing or enhancing) bodily characteristics, including, without limitation, height, weight, hair color, eye color, skin, fat to lean ratio or other tissue pigmentation, or organ or body part size or shape (such as, for example, breast augmentation or diminution, change in bone form or shape); effecting biorhythms or circadian cycles or rhythms; effecting the fertility of male or female subjects; effecting the metabolism, catabolism, anabolism, processing, utilization, storage or elimination of dietary fat, lipid, protein, carbohydrate, vitamins, minerals, co-factors or other nutritional factors or component(s); effecting behavioral characteristics, including, without limitation, appetite, libido, stress, cognition (including cognitive disorders), depression (including depressive disorders) and violent behaviors; providing analgesic effects or other pain reducing effects; promoting differentiation and growth of embryonic stem cells in lineages other than hematopoietic lineages; hormonal or endocrine activity; in the case of enzymes, correcting deficiencies of the enzyme and treating deficiency-related diseases; treatment of hyperproliferative disorders (such as, for example, psoriasis); immunoglobulin-like activity (such as, for example, the ability to bind antigens or complement); and the ability to act as an antigen in a vaccine composition to raise an immune response against such protein or another material or entity which is cross-reactive with such protein.

3.10.19 IDENTIFICATION OF POLYMORPHISMS

The demonstration of polymorphisms makes possible the identification of such polymorphisms in human subjects and the pharmacogenetic use of this information for diagnosis and treatment. Such polymorphisms may be associated with, e.g., differential predisposition or susceptibility to various disease states (such as disorders involving inflammation or immune response) or a differential response to drug administration, and this genetic information can be used to tailor preventive or therapeutic treatment appropriately. For example, the existence of a polymorphism associated with a predisposition to inflammation or autoimmune disease makes possible the diagnosis of this condition in humans by identifying the presence of the polymorphism.

Polymorphisms can be identified in a variety of ways known in the art which all generally involve obtaining a sample from a patient, analyzing DNA from the sample, optionally involving isolation or amplification of the DNA, and identifying the presence of the polymorphism in the DNA. For example, PCR may be used to amplify an appropriate fragment of genomic DNA, which may then be sequenced. Alternatively, the DNA may be subjected to allele-specific oligonucleotide hybridization (in which appropriate oligonucleotides are hybridized to the DNA under conditions permitting detection of a single base mismatch) or to a single nucleotide extension assay (in which an oligonucleotide that hybridizes immediately adjacent to the position of the polymorphism is extended with one or more labeled nucleotides). In addition, traditional restriction fragment length polymorphism analysis (using restriction enzymes that provide differential digestion of the genomic DNA depending on the presence or absence of the polymorphism) may be performed. Arrays with nucleotide sequences of the present invention can be used to detect polymorphisms. The array can comprise modified nucleotide sequences of the present invention in order to detect the nucleotide sequences of the present invention. In the alternative, any one of the nucleotide sequences of the present invention can be placed on the array to detect changes from those sequences.

Alternatively a polymorphism resulting in a change in the amino acid sequence could also be detected by detecting a corresponding change in amino acid sequence of the protein, e.g., by an antibody specific to the variant sequence.

3.10.20 ARTHRITIS AND INFLAMMATION

The immunosuppressive effects of the compositions of the invention against rheumatoid arthritis are determined in an experimental animal model system. The experimental model system is adjuvant induced arthritis in rats, and the protocol is described by J. Holoshitz, et al., 1983, Science, 219:56, or by B. Waksman et al., 1963, Int. Arch. Allergy Appl. Immunol., 23:129. Induction of the disease can be caused by a single injection, generally intradermally, of a

suspension of killed *Mycobacterium tuberculosis* in complete Freund's adjuvant (CFA). The route of injection can vary, but rats may be injected at the base of the tail with an adjuvant mixture. The polypeptide is administered in phosphate buffered solution (PBS) at a dose of about 1-5 mg/kg. The control consists of administering PBS only.

5 The procedure for testing the effects of the test compound would consist of intradermally injecting killed *Mycobacterium tuberculosis* in CFA followed by immediately administering the test compound and subsequent treatment every other day until day 24. At 14, 15, 18, 20, 22, and 24 days after injection of *Mycobacterium* CFA, an overall arthritis score may be obtained as described by J. Holoskitz above. An analysis of the data would reveal that the test compound
10 would have a dramatic affect on the swelling of the joints as measured by a decrease of the arthritis score.

3.11 THERAPEUTIC METHODS

 The compositions (including polypeptide fragments, analogs, variants and antibodies or
15 other binding partners or modulators including antisense polynucleotides) of the invention have numerous applications in a variety of therapeutic methods. Examples of therapeutic applications include, but are not limited to, those exemplified herein.

3.11.1 EXAMPLE

20 One embodiment of the invention is the administration of an effective amount of the polypeptides or other composition of the invention to individuals affected by a disease or disorder that can be modulated by regulating the peptides of the invention. While the mode of administration is not particularly important, parenteral administration is preferred. An exemplary mode of administration is to deliver an intravenous bolus. The dosage of the
25 polypeptides or other composition of the invention will normally be determined by the prescribing physician. It is to be expected that the dosage will vary according to the age, weight, condition and response of the individual patient. Typically, the amount of polypeptide administered per dose will be in the range of about 0.01 µg/kg to 100 mg/kg of body weight, with the preferred dose being about 0.1 µg/kg to 10 mg/kg of patient body weight. For parenteral
30 administration, polypeptides of the invention will be formulated in an injectable form combined with a pharmaceutically acceptable parenteral vehicle. Such vehicles are well known in the art and examples include water, saline, Ringer's solution, dextrose solution, and solutions consisting of small amounts of the human serum albumin. The vehicle may contain minor amounts of additives that maintain the isotonicity and stability of the polypeptide or other active ingredient.
35 The preparation of such solutions is within the skill of the art.

3.12 PHARMACEUTICAL FORMULATIONS AND ROUTES OF ADMINISTRATION

A protein or other composition of the present invention (from whatever source derived, including without limitation from recombinant and non-recombinant sources and including antibodies and other binding partners of the polypeptides of the invention) may be administered to a patient in need, by itself, or in pharmaceutical compositions where it is mixed with suitable carriers or excipient(s) at doses to treat or ameliorate a variety of disorders. Such a composition may optionally contain (in addition to protein or other active ingredient and a carrier) diluents, fillers, salts, buffers, stabilizers, solubilizers, and other materials well known in the art. The term "pharmaceutically acceptable" means a non-toxic material that does not interfere with the effectiveness of the biological activity of the active ingredient(s). The characteristics of the carrier will depend on the route of administration. The pharmaceutical composition of the invention may also contain cytokines, lymphokines, or other hematopoietic factors such as M-CSF, GM-CSF, TNF, IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-14, IL-15, IFN, TNF0, TNF1, TNF2, G-CSF, Meg-CSF, thrombopoietin, stem cell factor, and erythropoietin. In further compositions, proteins of the invention may be combined with other agents beneficial to the treatment of the disease or disorder in question. These agents include various growth factors such as epidermal growth factor (EGF), platelet-derived growth factor (PDGF), transforming growth factors (TGF- α and TGF- β), insulin-like growth factor (IGF), as well as cytokines described herein.

The pharmaceutical composition may further contain other agents that either enhance the activity of the protein or other active ingredient or complement its activity or use in treatment. Such additional factors and/or agents may be included in the pharmaceutical composition to produce a synergistic effect with protein or other active ingredient of the invention, or to minimize side effects. Conversely, protein or other active ingredient of the present invention may be included in formulations of the particular clotting factor, cytokine, lymphokine, other hematopoietic factor, thrombolytic or anti-thrombotic factor, or anti-inflammatory agent to minimize side effects of the clotting factor, cytokine, lymphokine, other hematopoietic factor, thrombolytic or anti-thrombotic factor, or anti-inflammatory agent (such as IL-1Ra, IL-1 Hy1, IL-1 Hy2, anti-TNF, corticosteroids, immunosuppressive agents). A protein of the present invention may be active in multimers (e.g., heterodimers or homodimers) or complexes with itself or other proteins. As a result, pharmaceutical compositions of the invention may comprise a protein of the invention in such multimeric or complexed form.

As an alternative to being included in a pharmaceutical composition of the invention including a first protein, a second protein or a therapeutic agent may be concurrently administered with the first protein (e.g., at the same time, or at differing times provided that therapeutic concentrations of the combination of agents is achieved at the treatment site).

5 Techniques for formulation and administration of the compounds of the instant application may be found in "Remington's Pharmaceutical Sciences," Mack Publishing Co., Easton, PA, latest edition. A therapeutically effective dose further refers to that amount of the compound sufficient to result in amelioration of symptoms, e.g., treatment, healing, prevention or amelioration of the relevant medical condition, or an increase in rate of treatment, healing, prevention or
10 amelioration of such conditions. When applied to an individual active ingredient, administered alone, a therapeutically effective dose refers to that ingredient alone. When applied to a combination, a therapeutically effective dose refers to combined amounts of the active ingredients that result in the therapeutic effect, whether administered in combination, serially or simultaneously.

15 In practicing the method of treatment or use of the present invention, a therapeutically effective amount of protein or other active ingredient of the present invention is administered to a mammal having a condition to be treated. Protein or other active ingredient of the present invention may be administered in accordance with the method of the invention either alone or in combination with other therapies such as treatments employing cytokines, lymphokines or other
20 hematopoietic factors. When co-administered with one or more cytokines, lymphokines or other hematopoietic factors, protein or other active ingredient of the present invention may be administered either simultaneously with the cytokine(s), lymphokine(s), other hematopoietic factor(s), thrombolytic or anti-thrombotic factors, or sequentially. If administered sequentially, the attending physician will decide on the appropriate sequence of administering protein or other
25 active ingredient of the present invention in combination with cytokine(s), lymphokine(s), other hematopoietic factor(s), thrombolytic or anti-thrombotic factors.

3.12.1 ROUTES OF ADMINISTRATION

Suitable routes of administration may, for example, include oral, rectal, transmucosal, or
30 intestinal administration; parenteral delivery, including intramuscular, subcutaneous, intramedullary injections, as well as intrathecal, direct intraventricular, intravenous, intraperitoneal, intranasal, or intraocular injections. Administration of protein or other active ingredient of the present invention used in the pharmaceutical composition or to practice the method of the present invention can be carried out in a variety of conventional ways, such as oral

ingestion, inhalation, topical application or cutaneous, subcutaneous, intraperitoneal, parenteral or intravenous injection. Intravenous administration to the patient is preferred.

Alternately, one may administer the compound in a local rather than systemic manner, for example, via injection of the compound directly into arthritic joints or in fibrotic tissue, often in a depot or sustained release formulation. In order to prevent the scarring process frequently occurring as complication of glaucoma surgery, the compounds may be administered topically, for example, as eye drops. Furthermore, one may administer the drug in a targeted drug delivery system, for example, in a liposome coated with a specific antibody, targeting, for example, arthritic or fibrotic tissue. The liposomes will be targeted to and taken up selectively by the afflicted tissue.

The polypeptides of the invention are administered by any route that delivers an effective dosage to the desired site of action. The determination of a suitable route of administration and an effective dosage for a particular indication is within the level of skill in the art. Preferably for wound treatment, one administers the therapeutic compound directly to the site. Suitable dosage ranges for the polypeptides of the invention can be extrapolated from these dosages or from similar studies in appropriate animal models. Dosages can then be adjusted as necessary by the clinician to provide maximal therapeutic benefit.

3.12.2 COMPOSITIONS/FORMULATIONS

Pharmaceutical compositions for use in accordance with the present invention thus may be formulated in a conventional manner using one or more physiologically acceptable carriers comprising excipients and auxiliaries which facilitate processing of the active compounds into preparations that can be used pharmaceutically. These pharmaceutical compositions may be manufactured in a manner that is itself known, *e.g.*, by means of conventional mixing, dissolving, granulating, dragee-making, levigating, emulsifying, encapsulating, entrapping or lyophilizing processes. Proper formulation is dependent upon the route of administration chosen. When a therapeutically effective amount of protein or other active ingredient of the present invention is administered orally, protein or other active ingredient of the present invention will be in the form of a tablet, capsule, powder, solution or elixir. When administered in tablet form, the pharmaceutical composition of the invention may additionally contain a solid carrier such as a gelatin or an adjuvant. The tablet, capsule, and powder contain from about 5 to 95% protein or other active ingredient of the present invention, and preferably from about 25 to 90% protein or other active ingredient of the present invention. When administered in liquid form, a liquid carrier such as water, petroleum, oils of animal or plant origin such as peanut oil, mineral oil, soybean oil, or sesame oil, or synthetic oils may be added. The liquid form of the

pharmaceutical composition may further contain physiological saline solution, dextrose or other saccharide solution, or glycols such as ethylene glycol, propylene glycol or polyethylene glycol. When administered in liquid form, the pharmaceutical composition contains from about 0.5 to 90% by weight of protein or other active ingredient of the present invention, and preferably from about 1 to 50% protein or other active ingredient of the present invention.

When a therapeutically effective amount of protein or other active ingredient of the present invention is administered by intravenous, cutaneous or subcutaneous injection, protein or other active ingredient of the present invention will be in the form of a pyrogen-free, parenterally acceptable aqueous solution. The preparation of such parenterally acceptable protein or other active ingredient solutions, having due regard to pH, isotonicity, stability, and the like, is within the skill in the art. A preferred pharmaceutical composition for intravenous, cutaneous, or subcutaneous injection should contain, in addition to protein or other active ingredient of the present invention, an isotonic vehicle such as Sodium Chloride Injection, Ringer's Injection, Dextrose Injection, Dextrose and Sodium Chloride Injection, Lactated Ringer's Injection, or other vehicle as known in the art. The pharmaceutical composition of the present invention may also contain stabilizers, preservatives, buffers, antioxidants, or other additives known to those of skill in the art. For injection, the agents of the invention may be formulated in aqueous solutions, preferably in physiologically compatible buffers such as Hanks's solution, Ringer's solution, or physiological saline buffer. For transmucosal administration, penetrants appropriate to the barrier to be permeated are used in the formulation. Such penetrants are generally known in the art.

For oral administration, the compounds can be formulated readily by combining the active compounds with pharmaceutically acceptable carriers well known in the art. Such carriers enable the compounds of the invention to be formulated as tablets, pills, dragees, capsules, liquids, gels, syrups, slurries, suspensions and the like, for oral ingestion by a patient to be treated. Pharmaceutical preparations for oral use can be obtained from a solid excipient, optionally grinding a resulting mixture, and processing the mixture of granules, after adding suitable auxiliaries, if desired, to obtain tablets or dragee cores. Suitable excipients are, in particular, fillers such as sugars, including lactose, sucrose, mannitol, or sorbitol; cellulose preparations such as, for example, maize starch, wheat starch, rice starch, potato starch, gelatin, gum tragacanth, methyl cellulose, hydroxypropylmethyl-cellulose, sodium carboxymethylcellulose, and/or polyvinylpyrrolidone (PVP). If desired, disintegrating agents may be added, such as the cross-linked polyvinyl pyrrolidone, agar, or alginic acid or a salt thereof such as sodium alginate. Dragee cores are provided with suitable coatings. For this purpose, concentrated sugar solutions may be used, which may optionally contain gum arabic,

talc, polyvinyl pyrrolidone, carbopol gel, polyethylene glycol, and/or titanium dioxide, lacquer solutions, and suitable organic solvents or solvent mixtures. Dyestuffs or pigments may be added to the tablets or dragee coatings for identification or to characterize different combinations of active compound doses.

5 Pharmaceutical preparations that can be used orally include push-fit capsules made of gelatin, as well as soft, sealed capsules made of gelatin and a plasticizer, such as glycerol or sorbitol. The push-fit capsules can contain the active ingredients in admixture with filler such as lactose, binders such as starches, and/or lubricants such as talc or magnesium stearate and, optionally, stabilizers. In soft capsules, the active compounds may be dissolved or suspended in
10 suitable liquids, such as fatty oils, liquid paraffin, or liquid polyethylene glycols. In addition, stabilizers may be added. All formulations for oral administration should be in dosages suitable for such administration. For buccal administration, the compositions may take the form of tablets or lozenges formulated in conventional manner.

 For administration by inhalation, the compounds for use according to the present
15 invention are conveniently delivered in the form of an aerosol spray presentation from pressurized packs or a nebuliser, with the use of a suitable propellant, *e.g.*, dichlorodifluoromethane, trichlorofluoromethane, dichlorotetrafluoroethane, carbon dioxide or other suitable gas. In the case of a pressurized aerosol the dosage unit may be determined by providing a valve to deliver a metered amount. Capsules and cartridges of, *e.g.*, gelatin for use
20 in an inhaler or insufflator may be formulated containing a powder mix of the compound and a suitable powder base such as lactose or starch. The compounds may be formulated for parenteral administration by injection, *e.g.*, by bolus injection or continuous infusion. Formulations for injection may be presented in unit dosage form, *e.g.*, in ampules or in multi-dose containers, with an added preservative. The compositions may take such forms as suspensions, solutions or
25 emulsions in oily or aqueous vehicles, and may contain formulatory agents such as suspending, stabilizing and/or dispersing agents.

 Pharmaceutical formulations for parenteral administration include aqueous solutions of the active compounds in water-soluble form. Additionally, suspensions of the active compounds may be prepared as appropriate oily injection suspensions. Suitable lipophilic solvents or
30 vehicles include fatty oils such as sesame oil, or synthetic fatty acid esters, such as ethyl oleate or triglycerides, or liposomes. Aqueous injection suspensions may contain substances that increase the viscosity of the suspension, such as sodium carboxymethyl cellulose, sorbitol, or dextran. Optionally, the suspension may also contain suitable stabilizers or agents that increase the solubility of the compounds to allow for the preparation of highly concentrated solutions.

Alternatively, the active ingredient may be in powder form for constitution with a suitable vehicle, *e.g.*, sterile pyrogen-free water, before use.

The compounds may also be formulated in rectal compositions such as suppositories or retention enemas, *e.g.*, containing conventional suppository bases such as cocoa butter or other glycerides. In addition to the formulations described previously, the compounds may also be formulated as a depot preparation. Such long acting formulations may be administered by implantation (for example subcutaneously or intramuscularly) or by intramuscular injection. Thus, for example, the compounds may be formulated with suitable polymeric or hydrophobic materials (for example as an emulsion in an acceptable oil) or ion exchange resins, or as sparingly soluble derivatives, for example, as a sparingly soluble salt.

A pharmaceutical carrier for the hydrophobic compounds of the invention is a co-solvent system comprising benzyl alcohol, a nonpolar surfactant, a water-miscible organic polymer, and an aqueous phase. The co-solvent system may be the VPD co-solvent system. VPD is a solution of 3% w/v benzyl alcohol, 8% w/v of the nonpolar surfactant polysorbate 80, and 65% w/v polyethylene glycol 300, made up to volume in absolute ethanol. The VPD co-solvent system (VPD:5W) consists of VPD diluted 1:1 with 5% dextrose in water solution. This co-solvent system dissolves hydrophobic compounds well, and itself produces low toxicity upon systemic administration. Naturally, the proportions of a co-solvent system may be varied considerably without destroying its solubility and toxicity characteristics. Furthermore, the identity of the co-solvent components may be varied: for example, other low-toxicity nonpolar surfactants may be used instead of polysorbate 80; the fraction size of polyethylene glycol may be varied; other biocompatible polymers may replace polyethylene glycol, *e.g.* polyvinyl pyrrolidone; and other sugars or polysaccharides may substitute for dextrose. Alternatively, other delivery systems for hydrophobic pharmaceutical compounds may be employed. Liposomes and emulsions are well known examples of delivery vehicles or carriers for hydrophobic drugs. Certain organic solvents such as dimethylsulfoxide also may be employed, although usually at the cost of greater toxicity. Additionally, the compounds may be delivered using a sustained-release system, such as semipermeable matrices of solid hydrophobic polymers containing the therapeutic agent. Various types of sustained-release materials have been established and are well known by those skilled in the art. Sustained-release capsules may, depending on their chemical nature, release the compounds for a few weeks up to over 100 days. Depending on the chemical nature and the biological stability of the therapeutic reagent, additional strategies for protein or other active ingredient stabilization may be employed.

The pharmaceutical compositions also may comprise suitable solid or gel phase carriers or excipients. Examples of such carriers or excipients include but are not limited to calcium

carbonate, calcium phosphate, various sugars, starches, cellulose derivatives, gelatin, and polymers such as polyethylene glycols. Many of the active ingredients of the invention may be provided as salts with pharmaceutically compatible counter ions. Such pharmaceutically acceptable base addition salts are those salts which retain the biological effectiveness and properties of the free acids and which are obtained by reaction with inorganic or organic bases such as sodium hydroxide, magnesium hydroxide, ammonia, trialkylamine, dialkylamine, monoalkylamine, dibasic amino acids, sodium acetate, potassium benzoate, triethanol amine and the like.

The pharmaceutical composition of the invention may be in the form of a complex of the protein(s) or other active ingredient(s) of present invention along with protein or peptide antigens. The protein and/or peptide antigen will deliver a stimulatory signal to both B and T lymphocytes. B-lymphocytes will respond to antigen through their surface immunoglobulin receptor. T-lymphocytes will respond to antigen through the T cell receptor (TCR) following presentation of the antigen by MHC proteins. MHC and structurally related proteins including those encoded by class I and class II MHC genes on host cells will serve to present the peptide antigen(s) to T lymphocytes. The antigen components could also be supplied as purified MHC-peptide complexes alone or with co-stimulatory molecules that can directly signal T cells. Alternatively antibodies able to bind surface immunoglobulin and other molecules on B cells as well as antibodies able to bind the TCR and other molecules on T cells can be combined with the pharmaceutical composition of the invention.

The pharmaceutical composition of the invention may be in the form of a liposome in which protein of the present invention is combined, in addition to other pharmaceutically acceptable carriers, with amphipathic agents such as lipids which exist in aggregated form as micelles, insoluble monolayers, liquid crystals, or lamellar layers in aqueous solution. Suitable lipids for liposomal formulation include, without limitation, monoglycerides, diglycerides, sulfatides, lysolecithins, phospholipids, saponin, bile acids, and the like. Preparation of such liposomal formulations is within the level of skill in the art, as disclosed, for example, in U.S. Patent Nos. 4,235,871; 4,501,728; 4,837,028; and 4,737,323, all of which are incorporated herein by reference.

The amount of protein or other active ingredient of the present invention in the pharmaceutical composition of the present invention will depend upon the nature and severity of the condition being treated, and on the nature of prior treatments that the patient has undergone. Ultimately, the attending physician will decide the amount of protein or other active ingredient of the present invention with which to treat each individual patient. Initially, the attending physician will administer low doses of protein or other active ingredient of the present invention

and observe the patient's response. Larger doses of protein or other active ingredient of the present invention may be administered until the optimal therapeutic effect is obtained for the patient, and at that point the dosage is not increased further. It is contemplated that the various pharmaceutical compositions used to practice the method of the present invention should contain
5 about 0.01 μ g to about 100 mg (preferably about 0.1 μ g to about 10 mg, more preferably about 0.1 μ g to about 1 mg) of protein or other active ingredient of the present invention per kg body weight. For compositions of the present invention that are useful for bone, cartilage, tendon or ligament regeneration, the therapeutic method includes administering the composition topically, systematically, or locally as an implant or device. When administered, the therapeutic
10 composition for use in this invention is, of course, in a pyrogen-free, physiologically acceptable form. Further, the composition may desirably be encapsulated or injected in a viscous form for delivery to the site of bone, cartilage or tissue damage. Topical administration may be suitable for wound healing and tissue repair. Therapeutically useful agents other than a protein or other active ingredient of the invention that may also optionally be included in the composition as
15 described above, may alternatively or additionally, be administered simultaneously or sequentially with the composition in the methods of the invention. Preferably for bone and/or cartilage formation, the composition would include a matrix capable of delivering the protein-containing or other active ingredient-containing composition to the site of bone and/or cartilage damage, providing a structure for the developing bone and cartilage and optimally
20 capable of being resorbed into the body. Such matrices may be formed of materials presently in use for other implanted medical applications.

The choice of matrix material is based on biocompatibility, biodegradability, mechanical properties, cosmetic appearance and interface properties. The particular application of the compositions will define the appropriate formulation. Potential matrices for the compositions
25 may be biodegradable and chemically defined calcium sulfate, tricalcium phosphate, hydroxyapatite, polylactic acid, polyglycolic acid and polyanhydrides. Other potential materials are biodegradable and biologically well-defined, such as bone or dermal collagen. Further matrices are comprised of pure proteins or extracellular matrix components. Other potential matrices are nonbiodegradable and chemically defined, such as sintered hydroxyapatite, bioglass,
30 aluminates, or other ceramics. Matrices may be comprised of combinations of any of the above-mentioned types of material, such as polylactic acid and hydroxyapatite or collagen and tricalcium phosphate. The bioceramics may be altered in composition, such as in calcium-aluminate-phosphate and processing to alter pore size, particle size, particle shape, and biodegradability. Presently preferred is a 50:50 (mole weight) copolymer of lactic acid and
35 glycolic acid in the form of porous particles having diameters ranging from 150 to 800 microns.

In some applications, it will be useful to utilize a sequestering agent, such as carboxymethyl cellulose or autologous blood clot, to prevent the protein compositions from disassociating from the matrix.

A preferred family of sequestering agents is cellulosic materials such as alkylcelluloses (including hydroxyalkylcelluloses), including methylcellulose, ethylcellulose, hydroxyethylcellulose, hydroxypropylcellulose, hydroxypropyl-methylcellulose, and carboxymethylcellulose, the most preferred being cationic salts of carboxymethylcellulose (CMC). Other preferred sequestering agents include hyaluronic acid, sodium alginate, poly (ethylene glycol), polyoxyethylene oxide, carboxyvinyl polymer and poly (vinyl alcohol). The amount of sequestering agent useful herein is 0.5-20 wt %, preferably 1-10 wt % based on total formulation weight, which represents the amount necessary to prevent desorption of the protein from the polymer matrix and to provide appropriate handling of the composition, yet not so much that the progenitor cells are prevented from infiltrating the matrix, thereby providing the protein the opportunity to assist the osteogenic activity of the progenitor cells. In further compositions, proteins or other active ingredients of the invention may be combined with other agents beneficial to the treatment of the bone and/or cartilage defect, wound, or tissue in question. These agents include various growth factors such as epidermal growth factor (EGF), platelet derived growth factor (PDGF), transforming growth factors (TGF- α and TGF- β), and insulin-like growth factor (IGF).

The therapeutic compositions are also presently valuable for veterinary applications. Particularly domestic animals and thoroughbred horses, in addition to humans, are desired patients for such treatment with proteins or other active ingredients of the present invention. The dosage regimen of a protein-containing pharmaceutical composition to be used in tissue regeneration will be determined by the attending physician considering various factors which modify the action of the proteins, *e.g.*, amount of tissue weight desired to be formed, the site of damage, the condition of the damaged tissue, the size of a wound, type of damaged tissue (*e.g.*, bone), the patient's age, sex, and diet, the severity of any infection, time of administration and other clinical factors. The dosage may vary with the type of matrix used in the reconstitution and with inclusion of other proteins in the pharmaceutical composition. For example, the addition of other known growth factors, such as IGF I (insulin like growth factor I), to the final composition, may also affect the dosage. Progress can be monitored by periodic assessment of tissue/bone growth and/or repair, for example, X-rays, histomorphometric determinations and tetracycline labeling.

Polynucleotides of the present invention can also be used for gene therapy. Such polynucleotides can be introduced either *in vivo* or *ex vivo* into cells for expression in a

mammalian subject. Polynucleotides of the invention may also be administered by other known methods for introduction of nucleic acid into a cell or organism (including, without limitation, in the form of viral vectors or naked DNA). Cells may also be cultured *ex vivo* in the presence of proteins of the present invention in order to proliferate or to produce a desired effect on or
5 activity in such cells. Treated cells can then be introduced *in vivo* for therapeutic purposes.

3.12.3 EFFECTIVE DOSAGE

Pharmaceutical compositions suitable for use in the present invention include compositions wherein the active ingredients are contained in an effective amount to achieve its
10 intended purpose. More specifically, a therapeutically effective amount means an amount effective to prevent development of or to alleviate the existing symptoms of the subject being treated. Determination of the effective amount is well within the capability of those skilled in the art, especially in light of the detailed disclosure provided herein. For any compound used in the method of the invention, the therapeutically effective dose can be estimated initially from
15 appropriate *in vitro* assays. For example, a dose can be formulated in animal models to achieve a circulating concentration range that can be used to more accurately determine useful doses in humans. For example, a dose can be formulated in animal models to achieve a circulating concentration range that includes the IC_{50} as determined in cell culture (*i.e.*, the concentration of the test compound which achieves a half-maximal inhibition of the protein's biological activity).
20 Such information can be used to more accurately determine useful doses in humans.

A therapeutically effective dose refers to that amount of the compound that results in amelioration of symptoms or a prolongation of survival in a patient. Toxicity and therapeutic efficacy of such compounds can be determined by standard pharmaceutical procedures in cell cultures or experimental animals, *e.g.*, for determining the LD_{50} (the dose lethal to 50% of the
25 population) and the ED_{50} (the dose therapeutically effective in 50% of the population). The dose ratio between toxic and therapeutic effects is the therapeutic index and it can be expressed as the ratio between LD_{50} and ED_{50} . Compounds that exhibit high therapeutic indices are preferred. The data obtained from these cell culture assays and animal studies can be used in formulating a range of dosage for use in human. The dosage of such compounds lies preferably within a range
30 of circulating concentrations that include the ED_{50} with little or no toxicity. The dosage may vary within this range depending upon the dosage form employed and the route of administration utilized. The exact formulation, route of administration and dosage can be chosen by the individual physician in view of the patient's condition. See, *e.g.*, Fingl et al., 1975, in "The Pharmacological Basis of Therapeutics", Ch. 1 p.1. Dosage amount and interval may be adjusted
35 individually to provide plasma levels of the active moiety that are sufficient to maintain the

desired effects, or minimal effective concentration (MEC). The MEC will vary for each compound but can be estimated from *in vitro* data. Dosages necessary to achieve the MEC will depend on individual characteristics and route of administration. However, HPLC assays or bioassays can be used to determine plasma concentrations.

5 Dosage intervals can also be determined using MEC value. Compounds should be administered using a regimen that maintains plasma levels above the MEC for 10-90% of the time, preferably between 30-90% and most preferably between 50-90%. In cases of local administration or selective uptake, the effective local concentration of the drug may not be related to plasma concentration.

10 An exemplary dosage regimen for polypeptides or other compositions of the invention will be in the range of about 0.01 µg/kg to 100 mg/kg of body weight daily, with the preferred dose being about 0.1 µg/kg to 25 mg/kg of patient body weight daily, varying in adults and children. Dosing may be once daily, or equivalent doses may be delivered at longer or shorter intervals.

15 The amount of composition administered will, of course, be dependent on the subject being treated, on the subject's age and weight, the severity of the affliction, the manner of administration and the judgment of the prescribing physician.

3.12.4 PACKAGING

20 The compositions may, if desired, be presented in a pack or dispenser device that may contain one or more unit dosage forms containing the active ingredient. The pack may, for example, comprise metal or plastic foil, such as a blister pack. The pack or dispenser device may be accompanied by instructions for administration. Compositions comprising a compound of the invention formulated in a compatible pharmaceutical carrier may also be prepared, placed in an
25 appropriate container, and labeled for treatment of an indicated condition.

3.13 ANTIBODIES

Also included in the invention are antibodies to proteins, or fragments of proteins of the invention. The term "antibody" as used herein refers to immunoglobulin molecules and
30 immunologically active portions of immunoglobulin (Ig) molecules, i.e., molecules that contain an antigen-binding site that specifically binds (immunoreacts with) an antigen. Such antibodies include, but are not limited to, polyclonal, monoclonal, chimeric, single chain, F_{ab}, F_{ab'} and F_{(ab')₂} fragments, and an F_{ab} expression library. In general, an antibody molecule obtained from humans relates to any of the classes IgG, IgM, IgA, IgE and IgD, which differ from one another
35 by the nature of the heavy chain present in the molecule. Certain classes have subclasses as well,

such as IgG₁, IgG₂, and others. Furthermore, in humans, the light chain may be a kappa chain or a lambda chain. Reference herein to antibodies includes a reference to all such classes, subclasses and types of human antibody species.

An isolated related protein of the invention may be intended to serve as an antigen, or a portion or fragment thereof, and additionally can be used as an immunogen to generate antibodies that immunospecifically bind the antigen, using standard techniques for polyclonal and monoclonal antibody preparation. The full-length protein can be used or, alternatively, the invention provides antigenic peptide fragments of the antigen for use as immunogens. An antigenic peptide fragment comprises at least 6 amino acid residues of the amino acid sequence of the full length protein, such as an amino acid sequence shown in SEQ ID NO: 88 – 174, 262-348 or 354-358, and encompasses an epitope thereof such that an antibody raised against the peptide forms a specific immune complex with the full length protein or with any fragment that contains the epitope. Preferably, the antigenic peptide comprises at least 10 amino acid residues, or at least 15 amino acid residues, or at least 20 amino acid residues, or at least 30 amino acid residues. Preferred epitopes encompassed by the antigenic peptide are regions of the protein that are located on its surface; commonly these are hydrophilic regions.

In certain embodiments of the invention, at least one epitope encompassed by the antigenic peptide is a region of TGF alpha-like protein that is located on the surface of the protein, e.g., a hydrophilic region. A hydrophobicity analysis of the human related protein sequence will indicate which regions of a related protein are particularly hydrophilic and, therefore, are likely to encode surface residues useful for targeting antibody production. As a means for targeting antibody production, hydropathy plots showing regions of hydrophilicity and hydrophobicity may be generated by any method well known in the art, including, for example, the Kyte Doolittle or the Hopp Woods methods, either with or without Fourier transformation. See, e.g., Hopp and Woods, 1981, *Proc. Nat. Acad. Sci. USA* 78: 3824-3828; Kyte and Doolittle 1982, *J. Mol. Biol.* 157: 105-142, each of which is incorporated herein by reference in its entirety. Antibodies that are specific for one or more domains within an antigenic protein, or derivatives, fragments, analogs or homologs thereof, are also provided herein.

A protein of the invention, or a derivative, fragment, analog, homolog or ortholog thereof, may be utilized as an immunogen in the generation of antibodies that immunospecifically bind these protein components.

The term “specific for” indicates that the variable regions of the antibodies of the invention recognize and bind polypeptides of the invention exclusively (*i.e.*, able to distinguish the polypeptide of the invention from other similar polypeptides despite sequence identity, homology, or similarity found in the family of polypeptides), but may also interact with other

proteins (for example, *S. aureus* protein A or other antibodies in ELISA techniques) through interactions with sequences outside the variable region of the antibodies, and in particular, in the constant region of the molecule. Screening assays to determine binding specificity of an antibody of the invention are well known and routinely practiced in the art. For a comprehensive
5 discussion of such assays, see Harlow et al. (Eds), *Antibodies A Laboratory Manual*; Cold Spring Harbor Laboratory; Cold Spring Harbor, NY (1988), Chapter 6. Antibodies that recognize and bind fragments of the polypeptides of the invention are also contemplated, provided that the antibodies are first and foremost specific for, as defined above, full-length polypeptides of the invention. As with antibodies that are specific for full length polypeptides of
10 the invention, antibodies of the invention that recognize fragments are those which can distinguish polypeptides from the same family of polypeptides despite inherent sequence identity, homology, or similarity found in the family of proteins.

Antibodies of the invention are useful for, for example, therapeutic purposes (by modulating activity of a polypeptide of the invention), diagnostic purposes to detect or quantitate
15 a polypeptide of the invention, as well as purification of a polypeptide of the invention. Kits comprising an antibody of the invention for any of the purposes described herein are also comprehended. In general, a kit of the invention also includes a control antigen for which the antibody is immunospecific. The invention further provides a hybridoma that produces an antibody according to the invention. Antibodies of the invention are useful for detection and/or
20 purification of the polypeptides of the invention.

Monoclonal antibodies binding to the protein of the invention may be useful diagnostic agents for the immunodetection of the protein. Neutralizing monoclonal antibodies binding to the protein may also be useful therapeutics for both conditions associated with the protein and also in the treatment of some forms of cancer where abnormal expression of the protein is
25 involved. In the case of cancerous cells or leukemic cells, neutralizing monoclonal antibodies against the protein may be useful in detecting and preventing the metastatic spread of the cancerous cells, which may be mediated by the protein.

The labeled antibodies of the present invention can be used for *in vitro*, *in vivo*, and *in situ* assays to identify cells or tissues in which a fragment of the polypeptide of interest is
30 expressed. The antibodies may also be used directly in therapies or other diagnostics. The present invention further provides the above-described antibodies immobilized on a solid support. Examples of such solid supports include plastics such as polycarbonate, complex carbohydrates such as agarose and Sepharose®, acrylic resins and such as polyacrylamide and latex beads. Techniques for coupling antibodies to such solid supports are well known in the art
35 (Weir, D.M. et al., "Handbook of Experimental Immunology" 4th Ed., Blackwell Scientific

Publications, Oxford, England, Chapter 10 (1986); Jacoby, W.D. et al., Meth. Enzym. 34 Academic Press, N.Y. (1974)). The immobilized antibodies of the present invention can be used for *in vitro*, *in vivo*, and *in situ* assays as well as for immuno-affinity purification of the proteins of the present invention.

5 Various procedures known within the art may be used for the production of polyclonal or monoclonal antibodies directed against a protein of the invention, or against derivatives, fragments, analogs homologs or orthologs thereof (see, for example, Antibodies: A Laboratory Manual, Harlow E, and Lane D, 1988, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, incorporated herein by reference). Some of these antibodies are discussed below.

10 3.13.1 POLYCLONAL ANTIBODIES

For the production of polyclonal antibodies, various suitable host animals (e.g., rabbit, goat, mouse or other mammal) may be immunized by one or more injections with the native protein, a synthetic variant thereof, or a derivative of the foregoing. An appropriate
15 immunogenic preparation can contain, for example, the naturally occurring immunogenic protein, a chemically synthesized polypeptide representing the immunogenic protein, or a recombinantly expressed immunogenic protein. Furthermore, the protein may be conjugated to a second protein known to be immunogenic in the mammal being immunized. Examples of such immunogenic proteins include but are not limited to keyhole limpet hemocyanin, serum albumin,
20 bovine thyroglobulin, and soybean trypsin inhibitor. The preparation can further include an adjuvant. Various adjuvants used to increase the immunological response include, but are not limited to, Freund's (complete and incomplete), mineral gels (e.g., aluminum hydroxide), surface-active substances (e.g., lysolecithin, pluronic polyols, polyanions, peptides, oil emulsions, dinitrophenol, etc.), adjuvants usable in humans such as Bacille Calmette-Guerin and
25 *Corynebacterium parvum*, or similar immunostimulatory agents. Additional examples of adjuvants that can be employed include MPL-TDM adjuvant (monophosphoryl Lipid A, synthetic trehalose dicorynomycolate).

The polyclonal antibody molecules directed against the immunogenic protein can be isolated from the mammal (e.g., from the blood) and further purified by well known techniques,
30 such as affinity chromatography using protein A or protein G, which provide primarily the IgG fraction of immune serum. Subsequently, or alternatively, the specific antigen which is the target of the immunoglobulin sought, or an epitope thereof, may be immobilized on a column to purify the immune specific antibody by immunoaffinity chromatography. Purification of immunoglobulins is discussed, for example, by D. Wilkinson (The Scientist, published by The
35 Scientist, Inc., Philadelphia PA, Vol. 14, No. 8 (April 17, 2000), pp. 25-28).

3.13.2 MONOCLONAL ANTIBODIES

The term "monoclonal antibody" (MAb) or "monoclonal antibody composition", as used herein, refers to a population of antibody molecules that contain only one molecular species of antibody molecule consisting of a unique light chain gene product and a unique heavy chain gene product. In particular, the complementarity determining regions (CDRs) of the monoclonal antibody are identical in all the molecules of the population. MAbs thus contain an antigen-binding site capable of immunoreacting with a particular epitope of the antigen characterized by a unique binding affinity for it.

Monoclonal antibodies can be prepared using hybridoma methods, such as those described by Kohler and Milstein, Nature, 256:495 (1975). In a hybridoma method, a mouse, hamster, or other appropriate host animal, is typically immunized with an immunizing agent to elicit lymphocytes that produce or are capable of producing antibodies that will specifically bind to the immunizing agent. Alternatively, the lymphocytes can be immunized in vitro.

The immunizing agent will typically include the protein antigen, a fragment thereof or a fusion protein thereof. Generally, either peripheral blood lymphocytes are used if cells of human origin are desired, or spleen cells or lymph node cells are used if non-human mammalian sources are desired. The lymphocytes are then fused with an immortalized cell line using a suitable fusing agent, such as polyethylene glycol, to form a hybridoma cell (Goding, Monoclonal Antibodies: Principles and Practice, Academic Press, (1986) pp. 59-103). Immortalized cell lines are usually transformed mammalian cells, particularly myeloma cells of rodent, bovine and human origin. Usually, rat or mouse myeloma cell lines are employed. The hybridoma cells can be cultured in a suitable culture medium that preferably contains one or more substances that inhibit the growth or survival of the unfused, immortalized cells. For example, if the parental cells lack the enzyme hypoxanthine guanine phosphoribosyl transferase (HGPRT or HPRT), the culture medium for the hybridomas typically will include hypoxanthine, aminopterin, and thymidine ("HAT medium"), which substances prevent the growth of HGPRT-deficient cells.

Preferred immortalized cell lines are those that fuse efficiently, support stable high level expression of antibody by the selected antibody-producing cells, and are sensitive to a medium such as HAT medium. More preferred immortalized cell lines are murine myeloma lines, which can be obtained, for instance, from the Salk Institute Cell Distribution Center, San Diego, California and the American Type Culture Collection, Manassas, Virginia. Human myeloma and mouse-human heteromyeloma cell lines also have been described for the production of human monoclonal antibodies (Kozbor, J. Immunol., 133:3001 (1984); Brodeur et al., Monoclonal

Antibody Production Techniques and Applications, Marcel Dekker, Inc., New York, (1987) pp. 51-63).

The culture medium in which the hybridoma cells are cultured can then be assayed for the presence of monoclonal antibodies directed against the antigen. Preferably, the binding
5 specificity of monoclonal antibodies produced by the hybridoma cells is determined by immunoprecipitation or by an in vitro binding assay, such as radioimmunoassay (RIA) or enzyme-linked immunoabsorbent assay (ELISA). Such techniques and assays are known in the art. The binding affinity of the monoclonal antibody can, for example, be determined by the Scatchard analysis of Munson and Pollard, Anal. Biochem., 107:220 (1980). Preferably,
10 antibodies having a high degree of specificity and a high binding affinity for the target antigen are isolated.

After the desired hybridoma cells are identified, the clones can be subcloned by limiting dilution procedures and grown by standard methods. Suitable culture media for this purpose include, for example, Dulbecco's Modified Eagle's Medium and RPMI-1640 medium.
15 Alternatively, the hybridoma cells can be grown in vivo as ascites in a mammal.

The monoclonal antibodies secreted by the subclones can be isolated or purified from the culture medium or ascites fluid by conventional immunoglobulin purification procedures such as, for example, protein A-Sepharose, hydroxylapatite chromatography, gel electrophoresis, dialysis, or affinity chromatography.

20 The monoclonal antibodies can also be made by recombinant DNA methods, such as those described in U.S. Patent No. 4,816,567. DNA encoding the monoclonal antibodies of the invention can be readily isolated and sequenced using conventional procedures (e.g., by using oligonucleotide probes that are capable of binding specifically to genes encoding the heavy and light chains of murine antibodies). The hybridoma cells of the invention serve as a preferred
25 source of such DNA. Once isolated, the DNA can be placed into expression vectors, which are then transfected into host cells such as simian COS cells, Chinese hamster ovary (CHO) cells, or myeloma cells that do not otherwise produce immunoglobulin protein, to obtain the synthesis of monoclonal antibodies in the recombinant host cells. The DNA also can be modified, for example, by substituting the coding sequence for human heavy and light chain constant domains
30 in place of the homologous murine sequences (U.S. Patent No. 4,816,567; Morrison, Nature 368, 812-13 (1994)) or by covalently joining to the immunoglobulin coding sequence all or part of the coding sequence for a non-immunoglobulin polypeptide. Such a non-immunoglobulin polypeptide can be substituted for the constant domains of an antibody of the invention, or can be substituted for the variable domains of one antigen-combining site of an antibody of the
35 invention to create a chimeric bivalent antibody.

3.13.3 HUMANIZED ANTIBODIES

The antibodies directed against the protein antigens of the invention can further comprise humanized antibodies or human antibodies. These antibodies are suitable for administration to humans without engendering an immune response by the human against the administered immunoglobulin. Humanized forms of antibodies are chimeric immunoglobulins, immunoglobulin chains or fragments thereof (such as Fv, Fab, Fab', F(ab')₂ or other antigen-binding subsequences of antibodies) that are principally comprised of the sequence of a human immunoglobulin, and contain minimal sequence derived from a non-human immunoglobulin. Humanization can be performed following the method of Winter and co-workers (Jones et al., Nature, 321:522-525 (1986); Riechmann et al., Nature, 332:323-327 (1988); Verhoeyen et al., Science, 239:1534-1536 (1988)), by substituting rodent CDRs or CDR sequences for the corresponding sequences of a human antibody. (See also U.S. Patent No. 5,225,539). In some instances, Fv framework residues of the human immunoglobulin are replaced by corresponding non-human residues. Humanized antibodies can also comprise residues that are found neither in the recipient antibody nor in the imported CDR or framework sequences. In general, the humanized antibody will comprise substantially all of at least one, and typically two, variable domains, in which all or substantially all of the CDR regions correspond to those of a non-human immunoglobulin and all or substantially all of the framework regions are those of a human immunoglobulin consensus sequence. The humanized antibody optimally also will comprise at least a portion of an immunoglobulin constant region (Fc), typically that of a human immunoglobulin (Jones et al., 1986; Riechmann et al., 1988; and Presta, Curr. Op. Struct. Biol., 2:593-596 (1992)).

3.13.4 HUMAN ANTIBODIES

Fully human antibodies relate to antibody molecules in which essentially the entire sequences of both the light chain and the heavy chain, including the CDRs, arise from human genes. Such antibodies are termed "human antibodies", or "fully human antibodies" herein. Human monoclonal antibodies can be prepared by the trioma technique; the human B-cell hybridoma technique (see Kozbor, et al., 1983 Immunol Today 4: 72) and the EBV hybridoma technique to produce human monoclonal antibodies (see Cole, et al., 1985 In: MONOCLONAL ANTIBODIES AND CANCER THERAPY, Alan R. Liss, Inc., pp. 77-96). Human monoclonal antibodies may be utilized in the practice of the present invention and may be produced by using human hybridomas (see Cote, et al., 1983. Proc Natl Acad Sci USA 80: 2026-2030) or by

transforming human B-cells with Epstein Barr Virus in vitro (see Cole, et al., 1985 In: MONOCLONAL ANTIBODIES AND CANCER THERAPY, Alan R. Liss, Inc., pp. 77-96).

In addition, human antibodies can also be produced using additional techniques, including phage display libraries (Hoogenboom and Winter, J. Mol. Biol., 227:381 (1991); Marks et al., J. Mol. Biol., 222:581 (1991)). Similarly, human antibodies can be made by introducing human immunoglobulin loci into transgenic animals, e.g., mice in which the endogenous immunoglobulin genes have been partially or completely inactivated. Upon challenge, human antibody production is observed, which closely resembles that seen in humans in all respects, including gene rearrangement, assembly, and antibody repertoire. This approach is described, for example, in U.S. Patent Nos. 5,545,807; 5,545,806; 5,569,825; 5,625,126; 5,633,425; 5,661,016, and in Marks et al. (Bio/Technology 10, 779-783 (1992)); Lonberg et al. (Nature 368 856-859 (1994)); Morrison (Nature 368, 812-13 (1994)); Fishwild et al, (Nature Biotechnology 14, 845-51 (1996)); Neuberger (Nature Biotechnology 14, 826 (1996)); and Lonberg and Huszar (Intern. Rev. Immunol. 13 65-93 (1995)).

Human antibodies may additionally be produced using transgenic nonhuman animals that are modified so as to produce fully human antibodies rather than the animal's endogenous antibodies in response to challenge by an antigen. (See PCT publication WO94/02602). The endogenous genes encoding the heavy and light immunoglobulin chains in the nonhuman host have been incapacitated, and active loci encoding human heavy and light chain immunoglobulins are inserted into the host's genome. The human genes are incorporated, for example, using yeast artificial chromosomes containing the requisite human DNA segments. An animal which provides all the desired modifications is then obtained as progeny by crossbreeding intermediate transgenic animals containing fewer than the full complement of the modifications. The preferred embodiment of such a nonhuman animal is a mouse, and is termed the XenomouseTM as disclosed in PCT publications WO 96/33735 and WO 96/34096. This animal produces B cells that secrete fully human immunoglobulins. The antibodies can be obtained directly from the animal after immunization with an immunogen of interest, as, for example, a preparation of a polyclonal antibody, or alternatively from immortalized B cells derived from the animal, such as hybridomas producing monoclonal antibodies. Additionally, the genes encoding the immunoglobulins with human variable regions can be recovered and expressed to obtain the antibodies directly, or can be further modified to obtain analogs of antibodies such as, for example, single chain Fv molecules.

An example of a method of producing a nonhuman host, exemplified as a mouse, lacking expression of an endogenous immunoglobulin heavy chain is disclosed in U.S. Patent No. 5,939,598. It can be obtained by a method including deleting the J segment genes from at least

one endogenous heavy chain locus in an embryonic stem cell to prevent rearrangement of the locus and to prevent formation of a transcript of a rearranged immunoglobulin heavy chain locus, the deletion being effected by a targeting vector containing a gene encoding a selectable marker; and producing from the embryonic stem cell a transgenic mouse whose somatic and germ cells
5 contain the gene encoding the selectable marker.

A method for producing an antibody of interest, such as a human antibody, is disclosed in U.S. Patent No. 5,916,771. It includes introducing an expression vector that contains a nucleotide sequence encoding a heavy chain into one mammalian host cell in culture, introducing an expression vector containing a nucleotide sequence encoding a light chain into another
10 mammalian host cell, and fusing the two cells to form a hybrid cell. The hybrid cell expresses an antibody containing the heavy chain and the light chain.

In a further improvement on this procedure, a method for identifying a clinically relevant epitope on an immunogen, and a correlative method for selecting an antibody that binds immunospecifically to the relevant epitope with high affinity, are disclosed in PCT publication
15 WO 99/53049.

3.13.5 FAB FRAGMENTS AND SINGLE CHAIN ANTIBODIES

According to the invention, techniques can be adapted for the production of single-chain antibodies specific to an antigenic protein of the invention (see e.g., U.S. Patent No. 4,946,778).
20 In addition, methods can be adapted for the construction of F_{ab} expression libraries (see e.g., Huse, et al., 1989 Science 246: 1275-1281) to allow rapid and effective identification of monoclonal F_{ab} fragments with the desired specificity for a protein or derivatives, fragments, analogs or homologs thereof. Antibody fragments that contain the idiotypes to a protein antigen may be produced by techniques known in the art including, but not limited to: (i) an $F_{(ab)2}$
25 fragment produced by pepsin digestion of an antibody molecule; (ii) an F_{ab} fragment generated by reducing the disulfide bridges of an $F_{(ab)2}$ fragment; (iii) an F_{ab} fragment generated by the treatment of the antibody molecule with papain and a reducing agent and (iv) F_v fragments.

3.13.6 BISPECIFIC ANTIBODIES

30 Bispecific antibodies are monoclonal, preferably human or humanized, antibodies that have binding specificities for at least two different antigens. In the present case, one of the binding specificities is for an antigenic protein of the invention. The second binding target is any other antigen, and advantageously is a cell-surface protein or receptor or receptor subunit.

Methods for making bispecific antibodies are known in the art. Traditionally, the
35 recombinant production of bispecific antibodies is based on the co-expression of two

immunoglobulin heavy-chain/light-chain pairs, where the two heavy chains have different specificities (Milstein and Cuello, Nature, 305:537-539 (1983)). Because of the random assortment of immunoglobulin heavy and light chains, these hybridomas (quadromas) produce a potential mixture of ten different antibody molecules, of which only one has the correct

5 bispecific structure. The purification of the correct molecule is usually accomplished by affinity chromatography steps. Similar procedures are disclosed in WO 93/08829, published 13 May 1993, and in Traunecker *et al.*, 1991 *EMBO J.*, 10:3655-3659.

Antibody variable domains with the desired binding specificities (antibody-antigen combining sites) can be fused to immunoglobulin constant domain sequences. The fusion

10 preferably is with an immunoglobulin heavy-chain constant domain, comprising at least part of the hinge, CH2, and CH3 regions. It is preferred to have the first heavy-chain constant region (CH1) containing the site necessary for light-chain binding present in at least one of the fusions. DNAs encoding the immunoglobulin heavy-chain fusions and, if desired, the immunoglobulin light chain, are inserted into separate expression vectors, and are co-transfected into a suitable

15 host organism. For further details of generating bispecific antibodies see, for example, Suresh *et al.*, Methods in Enzymology, 121:210 (1986).

According to another approach described in WO 96/27011, the interface between a pair of antibody molecules can be engineered to maximize the percentage of heterodimers that are recovered from recombinant cell culture. The preferred interface comprises at least a part of the

20 CH3 region of an antibody constant domain. In this method, one or more small amino acid side chains from the interface of the first antibody molecule are replaced with larger side chains (e.g. tyrosine or tryptophan). Compensatory "cavities" of identical or similar size to the large side chain(s) are created on the interface of the second antibody molecule by replacing large amino acid side chains with smaller ones (e.g. alanine or threonine). This provides a mechanism for

25 increasing the yield of the heterodimer over other unwanted end-products such as homodimers.

Bispecific antibodies can be prepared as full length antibodies or antibody fragments (e.g. F(ab')₂ bispecific antibodies). Techniques for generating bispecific antibodies from antibody fragments have been described in the literature. For example, bispecific antibodies can be prepared using chemical linkage. Brennan *et al.*, Science 229:81 (1985) describe a procedure

30 wherein intact antibodies are proteolytically cleaved to generate F(ab')₂ fragments. These fragments are reduced in the presence of the dithiol complexing agent sodium arsenite to stabilize vicinal dithiols and prevent intermolecular disulfide formation. The Fab' fragments generated are then converted to thionitrobenzoate (TNB) derivatives. One of the Fab'-TNB derivatives is then reconverted to the Fab'-thiol by reduction with mercaptoethylamine and is

35 mixed with an equimolar amount of the other Fab'-TNB derivative to form the bispecific

antibody. The bispecific antibodies produced can be used as agents for the selective immobilization of enzymes.

Additionally, Fab' fragments can be directly recovered from *E. coli* and chemically coupled to form bispecific antibodies. Shalaby et al., J. Exp. Med. 175:217-225 (1992) describe the production of a fully humanized bispecific antibody F(ab')₂ molecule. Each Fab' fragment was separately secreted from *E. coli* and subjected to directed chemical coupling in vitro to form the bispecific antibody. The bispecific antibody thus formed was able to bind to cells overexpressing the ErbB2 receptor and normal human T cells, as well as trigger the lytic activity of human cytotoxic lymphocytes against human breast tumor targets.

Various techniques for making and isolating bispecific antibody fragments directly from recombinant cell culture have also been described. For example, bispecific antibodies have been produced using leucine zippers. Kostelny et al., J. Immunol. 148(5):1547-1553 (1992). The leucine zipper peptides from the Fos and Jun proteins were linked to the Fab' portions of two different antibodies by gene fusion. The antibody homodimers were reduced at the hinge region to form monomers and then re-oxidized to form the antibody heterodimers. This method can also be utilized for the production of antibody homodimers. The "diabody" technology described by Hollinger et al., Proc. Natl. Acad. Sci. USA 90:6444-6448 (1993) has provided an alternative mechanism for making bispecific antibody fragments. The fragments comprise a heavy-chain variable domain (V_H) connected to a light-chain variable domain (V_L) by a linker which is too short to allow pairing between the two domains on the same chain. Accordingly, the V_H and V_L domains of one fragment are forced to pair with the complementary V_L and V_H domains of another fragment, thereby forming two antigen-binding sites. Another strategy for making bispecific antibody fragments by the use of single-chain Fv (sFv) dimers has also been reported. See, Gruber et al., J. Immunol. 152:5368 (1994).

Antibodies with more than two valencies are contemplated. For example, trispecific antibodies can be prepared. Tutt et al., J. Immunol. 147:60 (1991).

Exemplary bispecific antibodies can bind to two different epitopes, at least one of which originates in the protein antigen of the invention. Alternatively, an anti-antigenic arm of an immunoglobulin molecule can be combined with an arm which binds to a triggering molecule on a leukocyte such as a T-cell receptor molecule (e.g. CD2, CD3, CD28, or B7), or Fc receptors for IgG (Fc R), such as Fc RI (CD64), Fc RII (CD32) and Fc RIII (CD16) so as to focus cellular defense mechanisms to the cell expressing the particular antigen. Bispecific antibodies can also be used to direct cytotoxic agents to cells which express a particular antigen. These antibodies possess an antigen-binding arm and an arm which binds a cytotoxic agent or a

radionuclide chelator, such as EOTUBE, DPTA, DOTA, or TETA. Another bispecific antibody of interest binds the protein antigen described herein and further binds tissue factor (TF).

3.13.7 HETEROCONJUGATE ANTIBODIES

5 Heteroconjugate antibodies are also within the scope of the present invention. Heteroconjugate antibodies are composed of two covalently joined antibodies. Such antibodies have, for example, been proposed to target immune system cells to unwanted cells (U.S. Patent No. 4,676,980), and for treatment of HIV infection (WO 91/00360; WO 92/200373; EP 03089). It is contemplated that the antibodies can be prepared in vitro using known methods in synthetic
10 protein chemistry, including those involving crosslinking agents. For example, immunotoxins can be constructed using a disulfide exchange reaction or by forming a thioether bond. Examples of suitable reagents for this purpose include iminothiolate and methyl-4-mercaptobutyrimidate and those disclosed, for example, in U.S. Patent No. 4,676,980.

15 3.13.8 EFFECTOR FUNCTION ENGINEERING

It can be desirable to modify the antibody of the invention with respect to effector function, so as to enhance, e.g., the effectiveness of the antibody in treating cancer. For example, cysteine residue(s) can be introduced into the Fc region, thereby allowing interchain disulfide bond formation in this region. The homodimeric antibody thus generated can have
20 improved internalization capability and/or increased complement-mediated cell killing and antibody-dependent cellular cytotoxicity (ADCC). See Caron et al., J. Exp Med., 176: 1191-1195 (1992) and Shopes, J. Immunol., 148: 2918-2922 (1992). Homodimeric antibodies with enhanced anti-tumor activity can also be prepared using heterobifunctional cross-linkers as described in Wolff et al. Cancer Research, 53: 2560-2565 (1993). Alternatively, an antibody
25 can be engineered that has dual Fc regions and can thereby have enhanced complement lysis and ADCC capabilities. See Stevenson et al., Anti-Cancer Drug Design, 3: 219-230 (1989).

3.13.9 IMMUNOCONJUGATES

The invention also pertains to immunoconjugates comprising an antibody conjugated to a
30 cytotoxic agent such as a chemotherapeutic agent, toxin (e.g., an enzymatically active toxin of bacterial, fungal, plant, or animal origin, or fragments thereof), or a radioactive isotope (i.e., a radioconjugate).

Chemotherapeutic agents useful in the generation of such immunoconjugates have been described above. Enzymatically active toxins and fragments thereof that can be used include
35 diphtheria A chain, nonbinding active fragments of diphtheria toxin, exotoxin A chain (from

Pseudomonas aeruginosa), ricin A chain, abrin A chain, modeccin A chain, alpha-sarcin, Aleurites fordii proteins, dianthin proteins, Phytolaca americana proteins (PAPI, PAPII, and PAP-S), momordica charantia inhibitor, curcin, crotin, sapaonaria officinalis inhibitor, gelonin, mitogellin, restrictocin, phenomycin, enomycin, and the tricothecenes. A variety of
5 radionuclides are available for the production of radioconjugated antibodies. Examples include ^{212}Bi , ^{131}I , ^{131}In , ^{90}Y , and ^{186}Re .

Conjugates of the antibody and cytotoxic agent are made using a variety of bifunctional protein-coupling agents such as N-succinimidyl-3-(2-pyridyldithiol) propionate (SPDP), iminothiolane (IT), bifunctional derivatives of imidoesters (such as dimethyl adipimidate HCL),
10 active esters (such as disuccinimidyl suberate), aldehydes (such as glutaraldehyde), bis-azido compounds (such as bis (p-azidobenzoyl) hexanediamine), bis-diazonium derivatives (such as bis-(p-diazoniumbenzoyl)-ethylenediamine), diisocyanates (such as tolyene 2,6-diisocyanate), and bis-active fluorine compounds (such as 1,5-difluoro-2,4-dinitrobenzene). For example, a ricin immunotoxin can be prepared as described in Vitetta et al., Science, 238: 1098 (1987).
15 Carbon-14-labeled 1-isothiocyanatobenzyl-3-methyldiethylene triaminepentaacetic acid (MX-DTPA) is an exemplary chelating agent for conjugation of radionucleotide to the antibody. See WO94/11026.

In another embodiment, the antibody can be conjugated to a "receptor" (such as streptavidin) for utilization in tumor pretargeting wherein the antibody-receptor conjugate is
20 administered to the patient, followed by removal of unbound conjugate from the circulation using a clearing agent and then administration of a "ligand" (e.g., avidin) that is in turn conjugated to a cytotoxic agent.

3.14 COMPUTER READABLE SEQUENCES

25 In one application of this embodiment, a nucleotide sequence of the present invention can be recorded on computer readable media. As used herein, "computer readable media" refers to any medium that can be read and accessed directly by a computer. Such media include, but are not limited to: magnetic storage media, such as floppy discs, hard disc storage medium, and magnetic tape; optical storage media such as CD-ROM; electrical storage media such as RAM
30 and ROM; and hybrids of these categories such as magnetic/optical storage media. A skilled artisan can readily appreciate how any of the presently known computer readable mediums can be used to create a manufacture comprising computer readable medium having recorded thereon a nucleotide sequence of the present invention. As used herein, "recorded" refers to a process for storing information on computer readable medium. A skilled artisan can readily adopt any of the

presently known methods for recording information on computer readable medium to generate manufactures comprising the nucleotide sequence information of the present invention.

A variety of data storage structures are available to a skilled artisan for creating a computer readable medium having recorded thereon a nucleotide sequence of the present invention. The choice of the data storage structure will generally be based on the means chosen to access the stored information. In addition, a variety of data processor programs and formats can be used to store the nucleotide sequence information of the present invention on computer readable medium. The sequence information can be represented in a word processing text file, formatted in commercially-available software such as WordPerfect and Microsoft Word, or represented in the form of an ASCII file, stored in a database application, such as DB2, Sybase, Oracle, or the like. A skilled artisan can readily adapt any number of data processor structuring formats (e.g. text file or database) in order to obtain computer readable medium having recorded thereon the nucleotide sequence information of the present invention.

By providing any of the nucleotide sequences SEQ ID NOs: 1-87, 175-261 or 349-353, or a representative fragment thereof; or a nucleotide sequence at least 95% identical to any of the nucleotide sequences of SEQ ID NOs: 1-87, 175-261 or 349-353 in computer readable form, a skilled artisan can routinely access the sequence information for a variety of purposes. Computer software is publicly available which allows a skilled artisan to access sequence information provided in a computer readable medium. The examples which follow demonstrate how software which implements the BLAST (Altschul et al., J. Mol. Biol. 215:403-410 (1990)) and BLAZE (Brutlag et al., Comp. Chem. 17:203-207 (1993)) search algorithms on a Sybase system is used to identify open reading frames (ORFs) within a nucleic acid sequence. Such ORFs may be protein-encoding fragments and may be useful in producing commercially important proteins such as enzymes used in fermentation reactions and in the production of commercially useful metabolites.

As used herein, "a computer-based system" refers to the hardware means, software means, and data storage means used to analyze the nucleotide sequence information of the present invention. The minimum hardware means of the computer-based systems of the present invention comprises a central processing unit (CPU), input means, output means, and data storage means. A skilled artisan can readily appreciate that any one of the currently available computer-based systems are suitable for use in the present invention. As stated above, the computer-based systems of the present invention comprise a data storage means having stored therein a nucleotide sequence of the present invention and the necessary hardware means and software means for supporting and implementing a search means. As used herein, "data storage means" refers to memory which can store nucleotide sequence information of the present

invention, or a memory access means which can access manufactures having recorded thereon the nucleotide sequence information of the present invention.

As used herein, "search means" refers to one or more programs that are implemented on the computer-based system to compare a target sequence or target structural motif with the sequence information stored within the data storage means. Search means are used to identify fragments or regions of a known sequence that match a particular target sequence or target motif. A variety of known algorithms are disclosed publicly and a variety of commercially available software for conducting search means are and can be used in the computer-based systems of the present invention. Examples of such software include, but are not limited to, Smith-Waterman, MacPattern (EMBL), BLASTN and BLASTA (NPOLYPEPTIDEIA). A skilled artisan can readily recognize that any one of the available algorithms or implementing software packages for conducting homology searches can be adapted for use in the present computer-based systems. As used herein, a "target sequence" can be any nucleic acid or amino acid sequence of six or more nucleotides or two or more amino acids. A skilled artisan can readily recognize that the longer a target sequence is, the less likely a target sequence will be present as a random occurrence in the database. The most preferred sequence length of a target sequence is from about 10 to 300 amino acids; more preferably from about 30 to 100 nucleotide residues. However, it is well recognized that searches for commercially important fragments, such as sequence fragments involved in gene expression and protein processing, may be of shorter length.

As used herein, "a target structural motif," or "target motif," refers to any rationally selected sequence or combination of sequences in which the sequence(s) are chosen based on a three-dimensional configuration that is formed upon the folding of the target motif. There are a variety of target motifs known in the art. Protein target motifs include, but are not limited to, enzyme active sites and signal sequences. Nucleic acid target motifs include, but are not limited to, promoter sequences, hairpin structures and inducible expression elements (protein binding sequences).

3.15 TRIPLE HELIX FORMATION

In addition, the fragments of the present invention, as broadly described, can be used to control gene expression through triple helix formation or antisense DNA or RNA, both of which methods are based on the binding of a polynucleotide sequence to DNA or RNA. Polynucleotides suitable for use in these methods are preferably 20 to 40 bases in length and are designed to be complementary to a region of the gene involved in transcription (triple helix - see Lee et al., Nucl. Acids Res. 6:3073 (1979); Cooney et al., Science 15241:456 (1988); and Dervan

et al., Science 251:1360 (1991)) or to the mRNA itself (antisense - Olmno, J. Neurochem. 56:560 (1991); Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression, CRC Press, Boca Raton, FL (1988)). Triple helix-formation optimally results in a shut-off of RNA transcription from DNA, while antisense RNA hybridization blocks translation of an mRNA molecule into polypeptide. Both techniques have been demonstrated to be effective in model systems. Information contained in the sequences of the present invention is necessary for the design of an antisense or triple helix oligonucleotide.

3.16 DIAGNOSTIC ASSAYS AND KITS

10 The present invention further provides methods to identify the presence or expression of one of the ORFs of the present invention, or homolog thereof, in a test sample, using a nucleic acid probe or antibodies of the present invention, optionally conjugated or otherwise associated with a suitable label.

In general, methods for detecting a polynucleotide of the invention can comprise
15 contacting a sample with a compound that binds to and forms a complex with the polynucleotide for a period sufficient to form the complex, and detecting the complex, so that if a complex is detected, a polynucleotide of the invention is detected in the sample. Such methods can also comprise contacting a sample under stringent hybridization conditions with nucleic acid primers that anneal to a polynucleotide of the invention under such conditions, and amplifying annealed
20 polynucleotides, so that if a polynucleotide is amplified, a polynucleotide of the invention is detected in the sample.

In general, methods for detecting a polypeptide of the invention can comprise contacting a sample with a compound that binds to and forms a complex with the polypeptide for a period sufficient to form the complex, and detecting the complex, so that if a complex is detected, a
25 polypeptide of the invention is detected in the sample.

In detail, such methods comprise incubating a test sample with one or more of the antibodies or one or more of the nucleic acid probes of the present invention and assaying for binding of the nucleic acid probes or antibodies to components within the test sample.

Conditions for incubating a nucleic acid probe or antibody with a test sample vary.
30 Incubation conditions depend on the format employed in the assay, the detection methods employed, and the type and nature of the nucleic acid probe or antibody used in the assay. One skilled in the art will recognize that any one of the commonly available hybridization, amplification or immunological assay formats can readily be adapted to employ the nucleic acid probes or antibodies of the present invention. Examples of such assays can be found in Chard,
35 T., An Introduction to Radioimmunoassay and Related Techniques, Elsevier Science Publishers,

Amsterdam, The Netherlands (1986); Bullock, G.R. et al., Techniques in Immunocytochemistry, Academic Press, Orlando, FL Vol. 1 (1982), Vol. 2 (1983), Vol. 3 (1985); Tijssen, P., Practice and Theory of immunoassays: Laboratory Techniques in Biochemistry and Molecular Biology, Elsevier Science Publishers, Amsterdam, The Netherlands (1985). The test samples of the
5 present invention include cells, protein or membrane extracts of cells, or biological fluids such as sputum, blood, serum, plasma, or urine. The test sample used in the above-described method will vary based on the assay format, nature of the detection method and the tissues, cells or extracts used as the sample to be assayed. Methods for preparing protein extracts or membrane
10 extracts of cells are well known in the art and can be readily be adapted in order to obtain a sample which is compatible with the system utilized.

In another embodiment of the present invention, kits are provided which contain the necessary reagents to carry out the assays of the present invention. Specifically, the invention provides a compartment kit to receive, in close confinement, one or more containers which
15 comprises: (a) a first container comprising one of the probes or antibodies of the present invention; and (b) one or more other containers comprising one or more of the following: wash reagents, reagents capable of detecting presence of a bound probe or antibody.

In detail, a compartment kit includes any kit in which reagents are contained in separate containers. Such containers include small glass containers, plastic containers or strips of plastic or paper. Such containers allows one to efficiently transfer reagents from one compartment to
20 another compartment such that the samples and reagents are not cross-contaminated, and the agents or solutions of each container can be added in a quantitative fashion from one compartment to another. Such containers will include a container, which will accept the test sample, a container, which contains the antibodies used in the assay, containers, which contain wash reagents (such as phosphate buffered saline, Tris-buffers, etc.), and containers, which
25 contain the reagents used to detect the bound antibody or probe. Types of detection reagents include labeled nucleic acid probes, labeled secondary antibodies, or in the alternative, if the primary antibody is labeled, the enzymatic, or antibody binding reagents which are capable of reacting with the labeled antibody. One skilled in the art will readily recognize that the disclosed probes and antibodies of the present invention can be readily incorporated into one of the
30 established kit formats that are well known in the art.

3.17 MEDICAL IMAGING

The novel polypeptides and binding partners of the invention are useful in medical imaging of sites expressing the molecules of the invention (e.g., where the polypeptide of the
35 invention is involved in the immune response, for imaging sites of inflammation or infection).

See, e.g., Kunkel et al., U.S. Pat. No. 5,413,778. Such methods involve chemical attachment of a labeling or imaging agent, administration of the labeled polypeptide to a subject in a pharmaceutically acceptable carrier, and imaging the labeled polypeptide *in vivo* at the target site.

5

3.18 SCREENING ASSAYS

Using the isolated proteins and polynucleotides of the invention, the present invention further provides methods of obtaining and identifying agents which bind to a polypeptide set forth in SEQ ID NO: 88 – 174, 262-348 or 354-358 encoded by an ORF corresponding to any of the nucleotide sequences set forth in SEQ ID NOs: 1-87, 175-261 or 349-353, or which binds to a specific domain of the polypeptide encoded by the nucleic acid. In detail, said method comprises the steps of:

- (a) contacting an agent with an isolated protein encoded by an ORF of the present invention, or nucleic acid of the invention; and
- (b) determining whether the agent binds to said protein or said nucleic acid.

In general, therefore, such methods for identifying compounds that bind to a polynucleotide of the invention can comprise contacting a compound with a polynucleotide of the invention for a time sufficient to form a polynucleotide/compound complex, and detecting the complex, so that if a polynucleotide/compound complex is detected, a compound that binds to a polynucleotide of the invention is identified.

Likewise, in general, therefore, such methods for identifying compounds that bind to a polypeptide of the invention can comprise contacting a compound with a polypeptide of the invention for a time sufficient to form a polypeptide/compound complex, and detecting the complex, so that if a polypeptide/compound complex is detected, a compound that binds to a polynucleotide of the invention is identified.

Methods for identifying compounds that bind to a polypeptide of the invention can also comprise contacting a compound with a polypeptide of the invention in a cell for a time sufficient to form a polypeptide/compound complex, wherein the complex drives expression of a receptor gene sequence in the cell, and detecting the complex by detecting reporter gene sequence expression, so that if a polypeptide/compound complex is detected, a compound that binds a polypeptide of the invention is identified.

Compounds identified via such methods can include compounds that modulate the activity of a polypeptide of the invention (that is, increase or decrease its activity, relative to activity observed in the absence of the compound). Alternatively, compounds identified via such methods can include compounds that modulate the expression of a polynucleotide of the

invention (that is, increase or decrease expression relative to expression levels observed in the absence of the compound). Compounds, such as compounds identified via the methods of the invention, can be tested using standard assays well known to those of skill in the art for their ability to modulate activity/expression.

5 The agents screened in the above assay can be, but are not limited to, peptides, carbohydrates, vitamin derivatives, or other pharmaceutical agents. The agents can be selected and screened at random or rationally selected or designed using protein modeling techniques.

 For random screening, agents such as peptides, carbohydrates, pharmaceutical agents and the like are selected at random and are assayed for their ability to bind to the protein encoded by the ORF of the present invention. Alternatively, agents may be rationally selected or designed. As used herein, an agent is said to be "rationally selected or designed" when the agent is chosen based on the configuration of the particular protein. For example, one skilled in the art can readily adapt currently available procedures to generate peptides, pharmaceutical agents and the like, capable of binding to a specific peptide sequence, in order to generate rationally designed
10 antipeptide peptides, for example see Hurby et al., Application of Synthetic Peptides: Antisense Peptides," In Synthetic Peptides, A User's Guide, W.H. Freeman, NY (1992), pp. 289-307, and Kaspczak et al., Biochemistry 28:9230-8 (1989), or pharmaceutical agents, or the like.

 In addition to the foregoing, one class of agents of the present invention, as broadly described, can be used to control gene expression through binding to one of the ORFs or EMFs
20 of the present invention. As described above, such agents can be randomly screened or rationally designed/selected. Targeting the ORF or EMF allows a skilled artisan to design sequence specific or element specific agents, modulating the expression of either a single ORF or multiple ORFs that rely on the same EMF for expression control. One class of DNA binding agents are agents which contain base residues which hybridize or form a triple helix formation
25 by binding to DNA or RNA. Such agents can be based on the classic phosphodiester, ribonucleic acid backbone, or can be a variety of sulfhydryl or polymeric derivatives that have base attachment capacity.

 Agents suitable for use in these methods preferably contain 20 to 40 bases and are designed to be complementary to a region of the gene involved in transcription (triple helix - see
30 Lee et al., Nucl. Acids Res. 6:3073 (1979); Cooney et al., Science 241:456 (1988); and Dervan et al., Science 251:1360 (1991)) or to the mRNA itself (antisense - Okano, J. Neurochem. 56:560 (1991); Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression, CRC Press, Boca Raton, FL (1988)). Triple helix-formation optimally results in a shut-off of RNA transcription from DNA, while antisense RNA hybridization blocks translation of an mRNA molecule into
35 polypeptide. Both techniques have been demonstrated to be effective in model systems.

Information contained in the sequences of the present invention is necessary for the design of an antisense or triple helix oligonucleotide and other DNA binding agents.

Agents that bind to a protein encoded by one of the ORFs of the present invention can be used as a diagnostic agent. Agents that bind to a protein encoded by one of the ORFs of the present invention can be formulated using known techniques to generate a pharmaceutical composition.

3.19 USE OF NUCLEIC ACIDS AS PROBES

Another aspect of the subject invention is to provide for polypeptide-specific nucleic acid hybridization probes capable of hybridizing with naturally occurring nucleotide sequences. The hybridization probes of the subject invention may be derived from any of the nucleotide sequences SEQ ID NOs: 1-87, 175-261 or 349-353. Because the corresponding gene is only expressed in a limited number of tissues, a hybridization probe derived from any of the nucleotide sequences SEQ ID NOs: 1-87, 175-261 or 349-353 can be used as an indicator of the presence of RNA of cell type of such a tissue in a sample. Preferably a hybridization probe from any of nucleotide sequences SEQ ID NO: 1-87, 175-261 or 349-353 can be used as an indicator of bone marrow tissue.

Any suitable hybridization technique can be employed, such as, for example, in situ hybridization. PCR as described in US Patents Nos. 4,683,195 and 4,965,188 provides additional uses for oligonucleotides based upon the nucleotide sequences. Such probes used in PCR may be of recombinant origin, may be chemically synthesized, or a mixture of both. The probe will comprise a discrete nucleotide sequence for the detection of identical sequences or a degenerate pool of possible sequences for identification of closely related genomic sequences.

Other means for producing specific hybridization probes for nucleic acids include the cloning of nucleic acid sequences into vectors for the production of mRNA probes. Such vectors are known in the art and are commercially available and may be used to synthesize RNA probes *in vitro* by means of the addition of the appropriate RNA polymerase as T7 or SP6 RNA polymerase and the appropriate radioactively labeled nucleotides. The nucleotide sequences may be used to construct hybridization probes for mapping their respective genomic sequences. The nucleotide sequence provided herein may be mapped to a chromosome or specific regions of a chromosome using well-known genetic and/or chromosomal mapping techniques. These techniques include in situ hybridization, linkage analysis against known chromosomal markers, hybridization screening with libraries or flow-sorted chromosomal preparations specific to known chromosomes, and the like. The technique of fluorescent in situ hybridization of

chromosome spreads has been described, among other places, in Verma et al (1988) Human Chromosomes: A Manual of Basic Techniques, Pergamon Press, New York NY.

Fluorescent *in situ* hybridization of chromosomal preparations and other physical chromosome mapping techniques may be correlated with additional genetic map data. Examples of genetic map data can be found in the 1994 Genome Issue of Science (265:1981f). Correlation between the location of a nucleic acid on a physical chromosomal map and a specific disease (or predisposition to a specific disease) may help delimit the region of DNA associated with that genetic disease. The nucleotide sequences of the subject invention may be used to detect differences in gene sequences between normal, carrier or affected individuals.

3.20 PREPARATION OF SEQUENCING CHIPS AND ARRAYS

A basic example is using 6-mers attached to 50 micron surfaces to give a chip with dimensions of 3 x 3 mm which can be combined to give an array of 20 x 20 cm. Another example is using 9-mer oligonucleotides attached to 10 x 10 microns surface to create a 9-mer chip, with dimensions of 5 x 5 mm. 4000 units of such chips may be used to create a 30 x 30 array. In an array in which 4,000 to 16,000 oligochips are arranged into a square array. A plate, or collection of tubes, as also depicted, may be packaged with the array as part of the sequencing kit.

The arrays may be separated physically from each other or by hydrophobic surfaces. One possible way to utilize the hydrophobic strip separation is to use technology such as the Iso-Grid Microbiology System produced by QA Laboratories, Toronto, Canada.

Hydrophobic grid membrane filters (HGMF) have been in use in analytical food microbiology for about a decade where they exhibit unique attractions of extended numerical range and automated counting of colonies. One commercially available grid is ISO-GRID™ from QA Laboratories Ltd. (Toronto, Canada) which consists of a square (60 x 60 cm) of polysulfone polymer (Gelman Tuffryn HT-450, .45 um pore size) on which is printed a black hydrophobic ink grid consisting of 1600 (40 x 40) square cells. HGMF have previously been inoculated with bacterial suspensions by vacuum filtration and incubated on the differential or selective media of choice.

Because the microbial growth is confined to grid cells of known position and size on the membrane, the HGMF functions more like an MPN apparatus than a conventional plate or membrane filter. Peterkin et al. (1987) reported that these HGMFs can be used to propagate and store genomic libraries when used with a HGMF replicator. One such instrument replicates growth from each of the 1600 cells of the ISO-GRID and enables many copies of the master HGMF to be made (Peterkin et al., 1987):

Sharpe et al. (1989) also used ISO-GRID HGMF from QA Laboratories and an automated HGMF counter (MI-100 Interpreter) and RP-100 Replicator. They reported a technique for maintaining and screening many microbial cultures.

Peterkin and colleagues later described a method for screening DNA probes using the hydrophobic grid-membrane filter (Peterkin et al., 1989). These authors reported methods for effective colony hybridization directly on HGMFs. Previously, poor results had been obtained due to the low DNA binding capacity of the epoxysulfone polymer on which the HGMFs are printed. However, Peterkin et al. (1989) reported that the binding of the DNA to the surface of the membrane was improved by treating the replicated and incubated HGMF with polyethyleneimine, a polycation, prior to contact with DNA. Although this early work uses cellular DNA attachment, and has a different objective to the present invention, the methodology described may be readily adapted for Format 3 SBH.

In order to identify useful sequences rapidly, Peterkin et al. (1989) used radiolabeled plasmid DNA from various clones and tested its specificity against the DNA on the prepared HGMFs. In this way, DNA from recombinant plasmids was rapidly screened by colony hybridization against 100 organisms on HGMF replicates that can be easily and reproducibly prepared.

Manipulation with small (2-3 mm) chips, and parallel execution of thousands of the reactions. The solution of the invention is to keep the chips and the probes in the corresponding arrays. In one example, chips containing 250,000 9-mers are synthesized on a silicon wafer in the form of 8 x 8 mm plates (15 uM/oligonucleotide, Pease et al., 1994) arrayed in 8 x 12 format (96 chips) with a 1 mM groove in between. Probes are added either by multichannel pipette or pin array, one probe on one chip. To score all 4000 6-mers, 42 chip arrays have to be used, either using different ones, or by reusing one set of chip arrays several times.

In the above case, using the earlier nomenclature of the application, F=9; P=6; and F+P=15. Chips may have probes of formula BxNn, where x is a number of specified bases B; and n is a number of non-specified bases, so that x= 4 to 10 and n= 1 to 4. To achieve more efficient hybridization, and to avoid potential influence of any support oligonucleotides, the specified bases can be surrounded by unspecified bases, thus represented by a formula such as (N)nBx(N)m.

3.21 PREPARATION OF SUPPORT BOUND OLIGONUCLEOTIDES

Oligonucleotides, i.e., small nucleic acid segments, may be readily prepared by, for example, directly synthesizing the oligonucleotide by chemical means, as is commonly practiced using an automated oligonucleotide synthesizer.

Support bound oligonucleotides may be prepared by any of the methods known to those of skill in the art using any suitable support such as glass, polystyrene or Teflon. One strategy is to precisely spot oligonucleotides synthesized by standard synthesizers. Immobilization can be achieved using passive adsorption (Inouye & Hondo, (1990) J. Clin. Microbiol. 28(6) 1469-72);
5 using UV light (Nagata *et al.*, 1985; Dahlen *et al.*, 1987; Morrissey & Collins, (1989) Mol. Cell Probes 3(2) 189-207) or by covalent binding of base modified DNA (Keller *et al.*, 1988; 1989); all references being specifically incorporated herein.

Another strategy that may be employed is the use of the strong biotin-streptavidin interaction as a linker. For example, Broude *et al.* (1994) Proc. Natl. Acad. Sci. USA 91(8) 3072-6,
10 describe the use of biotinylated probes, although these are duplex probes that are immobilized on streptavidin-coated magnetic beads. Streptavidin-coated beads may be purchased from Dynal, Oslo. Of course, this same linking chemistry is applicable to coating any surface with streptavidin. Biotinylated probes may be purchased from various sources, such as, e.g., Operon Technologies (Alameda, CA).

15 Nunc Laboratories (Naperville, IL) is also selling suitable material that could be used. Nunc Laboratories have developed a method by which DNA can be covalently bound to the microwell surface termed CovaLink NH. CovaLink NH is a polystyrene surface grafted with secondary amino groups (>NH) that serve as bridge-heads for further covalent coupling. CovaLink Modules may be purchased from Nunc Laboratories. DNA molecules may be bound to CovaLink exclusively at the
20 5'-end by a phosphoramidate bond, allowing immobilization of more than 1 pmol of DNA (Rasmussen *et al.*, (1991) Anal. Biochem. 198(1) 138-42).

The use of CovaLink NH strips for covalent binding of DNA molecules at the 5'-end has been described (Rasmussen *et al.*, (1991). In this technology, a phosphoramidate bond is employed (Chu *et al.*, (1983) Nucleic Acids Res. 11(8) 6513-29). This is beneficial as immobilization using
25 only a single covalent bond is preferred. The phosphoramidate bond joins the DNA to the CovaLink NH secondary amino groups that are positioned at the end of spacer arms covalently grafted onto the polystyrene surface through a 2 nm long spacer arm. To link an oligonucleotide to CovaLink NH via a phosphoramidate bond, the oligonucleotide terminus must have a 5'-end phosphate group. It is, perhaps, even possible for biotin to be covalently bound to CovaLink and
30 then streptavidin used to bind the probes.

More specifically, the linkage method includes dissolving DNA in water (7.5 ng/ul) and denaturing for 10 min. at 95°C and cooling on ice for 10 min. Ice-cold 0.1 M 1-methylimidazole, pH 7.0 (1-MeIm₇), is then added to a final concentration of 10 mM 1-MeIm₇. A ss DNA solution is then dispensed into CovaLink NH strips (75 ul/well) standing on ice.

Carbodiimide 0.2 M 1-ethyl-3-(3-dimethylaminopropyl)-carbodiimide (EDC), dissolved in 10 mM 1-MeIm₇, is made fresh and 25 ul added per well. The strips are incubated for 5 hours at 50°C. After incubation the strips are washed using, e.g., Nunc-Immuno Wash; first the wells are washed 3 times, then they are soaked with washing solution for 5 min., and finally they are washed
5 3 times (where in the washing solution is 0.4 N NaOH, 0.25% SDS heated to 50°C).

It is contemplated that a further suitable method for use with the present invention is that described in PCT Patent Application WO 90/03382 (Southern & Maskos), incorporated herein by reference. This method of preparing an oligonucleotide bound to a support involves attaching a nucleoside 3'-reagent through the phosphate group by a covalent phosphodiester link to aliphatic
10 hydroxyl groups carried by the support. The oligonucleotide is then synthesized on the supported nucleoside and protecting groups removed from the synthetic oligonucleotide chain under standard conditions that do not cleave the oligonucleotide from the support. Suitable reagents include nucleoside phosphoramidite and nucleoside hydrogen phosphate.

An on-chip strategy for the preparation of DNA probe for the preparation of DNA probe
15 arrays may be employed. For example, addressable laser-activated photodeprotection may be employed in the chemical synthesis of oligonucleotides directly on a glass surface, as described by Fodor *et al.* (1991) Science 251(4995) 767-73, incorporated herein by reference. Probes may also be immobilized on nylon supports as described by Van Ness *et al.* (1991) Nucleic Acids Res. 19(12) 3345-50; or linked to Teflon using the method of Duncan & Cavalier (1988) Anal. Biochem.
20 169(1) 104-8; all references being specifically incorporated herein.

To link an oligonucleotide to a nylon support, as described by Van Ness *et al.* (1991), requires activation of the nylon surface via alkylation and selective activation of the 5'-amine of oligonucleotides with cyanuric chloride.

One particular way to prepare support bound oligonucleotides is to utilize the
25 light-generated synthesis described by Pease *et al.*, (1994) Proc. Natl. Acad. Sci. USA 91(11) 5022-6, incorporated herein by reference). These authors used current photolithographic techniques to generate arrays of immobilized oligonucleotide probes (DNA chips). These methods, in which light is used to direct the synthesis of oligonucleotide probes in high-density, miniaturized arrays, utilize photolabile 5'-protected *N*-acyl-deoxynucleoside phosphoramidites, surface linker chemistry and
30 versatile combinatorial synthesis strategies. A matrix of 256 spatially defined oligonucleotide probes may be generated in this manner.

3.22 PREPARATION OF NUCLEIC ACID FRAGMENTS

The nucleic acids may be obtained from any appropriate source, such as cDNAs, genomic DNA, chromosomal DNA, microdissected chromosome bands, cosmid or YAC inserts, and RNA,

including mRNA without any amplification steps. For example, Sambrook *et al.* (1989) describes three protocols for the isolation of high molecular weight DNA from mammalian cells (p. 9.14-9.23).

5 DNA fragments may be prepared as clones in M13, plasmid or lambda vectors and/or prepared directly from genomic DNA or cDNA by PCR or other amplification methods. Samples may be prepared or dispensed in multiwell plates. About 100-1000 ng of DNA samples may be prepared in 2-500 ml of final volume.

The nucleic acids would then be fragmented by any of the methods known to those of skill in the art including, for example, using restriction enzymes as described at 9.24-9.28 of Sambrook *et al.* (1989), shearing by ultrasound and NaOH treatment.

10 Low pressure shearing is also appropriate, as described by Schrieffer *et al.* (1990) Nucleic Acids Res. 18(24) 7455-6, incorporated herein by reference). In this method, DNA samples are passed through a small French pressure cell at a variety of low to intermediate pressures. A lever device allows controlled application of low to intermediate pressures to the cell. The results of these studies indicate that low-pressure shearing is a useful alternative to sonic and enzymatic DNA fragmentation methods.

One particularly suitable way for fragmenting DNA is contemplated to be that using the two base recognition endonuclease, *Cvi*II, described by Fitzgerald *et al.* (1992) Nucleic Acids Res. 20(14) 3753-62. These authors described an approach for the rapid fragmentation and fractionation of DNA into particular sizes that they contemplated to be suitable for shotgun cloning and sequencing.

25 The restriction endonuclease *Cvi*II normally cleaves the recognition sequence PuGCPy between the G and C to leave blunt ends. Atypical reaction conditions, which alter the specificity of this enzyme (*Cvi*II**), yield a quasi-random distribution of DNA fragments from the small molecule pUC19 (2688 base pairs). Fitzgerald *et al.* (1992) quantitatively evaluated the randomness of this fragmentation strategy, using a *Cvi*II** digest of pUC19 that was size fractionated by a rapid gel filtration method and directly ligated, without end repair, to a lac Z minus M13 cloning vector. Sequence analysis of 76 clones showed that *Cvi*II** restricts pyGCPy and PuGCPu, in addition to PuGCPy sites, and that new sequence data is accumulated at a rate consistent with random fragmentation.

30 As reported in the literature, advantages of this approach compared to sonication and agarose gel fractionation include: smaller amounts of DNA are required (0.2-0.5 ug instead of 2-5 ug); and fewer steps are involved (no preligation, end repair, chemical extraction, or agarose gel electrophoresis and elution are needed).

Irrespective of the manner in which the nucleic acid fragments are obtained or prepared, it is important to denature the DNA to give single stranded pieces available for hybridization. This is achieved by incubating the DNA solution for 2-5 minutes at 80-90°C. The solution is then cooled quickly to 2°C to prevent renaturation of the DNA fragments before they are contacted with the chip. Phosphate groups must also be removed from genomic DNA by methods known in the art.

3.23 PREPARATION OF DNA ARRAYS

Arrays may be prepared by spotting DNA samples on a support such as a nylon membrane. Spotting may be performed by using arrays of metal pins (the positions of which correspond to an array of wells in a microtiter plate) to repeated by transfer of about 20 nl of a DNA solution to a nylon membrane. By offset printing, a density of dots higher than the density of the wells is achieved. One to 25 dots may be accommodated in 1 mm², depending on the type of label used. By avoiding spotting in some preselected number of rows and columns, separate subsets (subarrays) may be formed. Samples in one subarray may be the same genomic segment of DNA (or the same gene) from different individuals, or may be different, overlapped genomic clones. Each of the subarrays may represent replica spotting of the same samples. In one example, a selected gene segment may be amplified from 64 patients. For each patient, the amplified gene segment may be in one 96-well plate (all 96 wells containing the same sample). A plate for each of the 64 patients is prepared. By using a 96-pin device, all samples may be spotted on one 8 x 12 cm membrane. Subarrays may contain 64 samples, one from each patient. Where the 96 subarrays are identical, the dot span may be 1 mm² and there may be a 1 mm space between subarrays.

Another approach is to use membranes or plates (available from NUNC, Naperville, Illinois) which may be partitioned by physical spacers e.g. a plastic grid molded over the membrane, the grid being similar to the sort of membrane applied to the bottom of multiwell plates, or hydrophobic strips. A fixed physical spacer is not preferred for imaging by exposure to flat phosphor-storage screens or x-ray films.

The present invention is illustrated in the following examples. Upon consideration of the present disclosure, one of skill in the art will appreciate that many other embodiments and variations may be made in the scope of the present invention. Accordingly, it is intended that the broader aspects of the present invention not be limited to the disclosure of the following examples. The present invention is not to be limited in scope by the exemplified embodiments that are intended as illustrations of single aspects of the invention, and compositions and methods that are functionally equivalent are within the scope of the invention. Indeed, numerous modifications and variations in the practice of the invention are expected to occur to those skilled in the art upon consideration of

the present preferred embodiments. Consequently, the only limitations that should be placed upon the scope of the invention are those which appear in the appended claims.

All references cited within the body of the instant specification are hereby incorporated by reference in their entirety.

5 4.0 EXAMPLES

4.1 EXAMPLE 1

Novel Nucleic Acid Sequences Obtained From Various Libraries

A plurality of novel nucleic acids were obtained from cDNA libraries prepared from various human tissues and in some cases isolated from a genomic library derived from human chromosomes using standard PCR, SBH sequence signature analysis and Sanger sequencing techniques. The inserts of the library were amplified with PCR using primers specific for the vector sequences that flank the inserts. Clones from cDNA libraries were spotted on nylon membrane filters and screened with oligonucleotide probes (e.g., 7-mers) to obtain signature sequences. The clones were clustered into groups of similar or identical sequences. Representative clones from each cluster were selected for sequencing.

The sequence of the amplified inserts, in some cases, was then deduced using a typical Sanger sequencing protocol. PCR products were purified and subjected to fluorescent dye terminator cycle sequencing. Single pass gel sequencing was done using a 377 Applied Biosystems (ABI) sequencer to obtain the novel nucleic acid sequences.

20 4.2 EXAMPLE 2

Novel Nucleic Acids

The novel nucleic acids of the present invention were assembled from sequences that were obtained from a cDNA library by methods described in Example 1 above, and in some cases sequences obtained from one or more public databases. The nucleic acids of SEQ ID NO: 1-87, inclusive, were assembled using an EST sequence as a seed. Then a recursive algorithm was used to extend some of the seed ESTs into an extended assemblage, by pulling additional sequences from different databases (i.e., Hyseq's database containing EST sequences, dbEST version 119, gb pri 119, and UniGene version 119, Geneseq October version, and Genscan, Genemark and Hyseq gene predictions on human genomic sequence from the human genome project updated October 2000) that belong to this assemblage. The algorithm terminated when there was no additional sequences from the above databases that would extend the assemblage. Inclusion of component sequences into the assemblage was based on a BLASTN hit to the extending assemblage with BLAST score greater than 300 and percent identity greater than 95%.

4.3 EXAMPLE 3

Further Characterization

Clusters from Example 1 were identified which were expressed in bone marrow tissue
5 cDNA libraries, but not in other tissues. Novel nucleic acids were assembled by the method of
Example 2. A subset of the assembled nucleic acids comprising sequences from the identified
clusters was selected. This subset includes SEQ ID NO: 1-87. The tissue sources in which SEQ ID
NO: 1-87 were exclusively expressed were found to be in BMD001 and BMD002 bone marrow
libraries (Clontech).

10 The homologies for SEQ ID NO: 1-87 and the corresponding peptide sequences, SEQ ID
NO: 88 – 174 were obtained by performing various searches as shown in Tables 1A to 1D and as
discussed herein.

The homologous sequences to SEQ ID NO: 88-174 were obtained by a BLASTP version
2.0a1 19MP-WashU search against the Geneseq database updated November 9, 2000, update 23
15 for year 2000 (Derwent), using the BLAST algorithm. The homologues for SEQ ID NO: 88-174
from Geneseq are shown in Table 1A below.

The homologous sequences to SEQ ID NO: 88-174 were also obtained by a BLASTP
version 2.0a1 19MP-WashU search against the NCBI Genbank nr database updated November
10, 2000, using the BLAST algorithm. The homologues for SEQ ID NO: 88-174 from Genbank
20 are shown in Table 1B below.

The homologous sequences to SEQ ID NO: 1-87 were also obtained by a BLASTN
version 2.0a1 19MP-WashU search against the Geneseq database updated November 9, 2000,
update 23 for year 2000 (Derwent), using the BLAST algorithm. The homologues for SEQ ID
NO: 1-87 from Geneseq are shown in Table 1C below.

25 The homologous sequences to SEQ ID NO: 1-87 were also obtained by a BLASTN
version 2.0a1 19MP-WashU search against the NCBI Genbank nt database updated November
10, 2000, using the BLAST algorithm. The homologues for SEQ ID NO: 1-87 from Genbank
are shown in Table 1D below.

Using eMatrix software package (Stanford University, Stanford, CA) (Wu et al., J.
30 Comp. Biol., Vol. 6 pp. 219-235 (1999) herein incorporated by reference), the polypeptide
sequences corresponding to SEQ ID NO: 1-87 and 349-353 were examined to determine whether
they had identifiable signature regions. Table 2 and 8 shows the signature region found in the
indicated polypeptide sequences, the description of the signature, the eMatrix p-value(s) and the
position(s) of the signature within the polypeptide sequence.

Using the PFam software program (Sonnhammer et al., Nucleic Acids Res., Vol. 26(1) pp. 320-322 (1998) herein incorporated by reference) the polypeptide sequences corresponding to SEQ ID NO: 1-87 and 349-353 were examined for domains with homology to certain peptide domains. Table 3 shows the name of the domain found, the description, the e-value and the PFam score for the identified domain within the sequence.

The polypeptide sequence within each of SEQ ID NO: 88-174 that is the predicted signal peptide sequence and its cleavage site can be determined using Neural Network SignalP V1.1 program (from Center for Biological Sequence Analysis, The Technical University of Denmark). The process for identifying prokaryotic and eukaryotic signal peptides and their cleavage sites are also disclosed by Henrik Nielson, Jacob Engelbrecht, Soren Brunak, and Gunnar von Heijne in the publication "Identification of prokaryotic and eukaryotic signal peptides and prediction of their cleavage sites" Protein Engineering, Vol. 10, no. 1, pp. 1-6 (1997), incorporated herein by reference. A mean S score, as described in the Nielson et. al. was obtained for the polypeptide sequences. Table 4 shows the position of the predicted signal peptide in each of the polypeptides and the mean score associated with that signal peptide.

Table 5 provides a correlation between the amino acid sequences set forth in the sequence listing, the nucleotide sequence encoding the amino acid sequence, the corresponding contig nucleotide sequence and amino acid sequence determined by the method of Example 4 and the corresponding full length edited sequence determined by the method of Examples 5 and 6.

4.4 EXAMPLE 4

Assemblage of Novel Nucleic Acids

The contigs or nucleic acids of the present invention, designated as SEQ ID NO: 175-261 were assembled using an EST sequence as a seed. Then a recursive algorithm was used to extend the seed EST into an extended assemblage, by pulling additional sequences from different databases (i.e., Hyseq's database containing EST sequences, dbEST version 114, gb pri 114, and UniGene version 101) that belong to this assemblage. The algorithm terminated when there was no additional sequences from the above databases that would extend the assemblage. Inclusion of component sequences into the assemblage was based on a BLASTN hit to the extending assemblage with BLAST score greater than 300 and percent identity greater than 95%.

The nucleotide sequence within the assembled contigs that codes for signal peptide sequences and their cleavage sites was determined from using Neural Network SignalP V1.1 program (from Center for Biological Sequence Analysis, The Technical University of Denmark). The process for identifying prokaryotic and eukaryotic signal peptides and their cleavage sites are also disclosed by Henrik Nielson, Jacob Engelbrecht, Soren Brunak, and Gunnar von Heijne in the

publication "Identification of prokaryotic and eukaryotic signal peptides and prediction of their cleavage sites" Protein Engineering, vol. 10, no. 1, pp.1-6 (1997) incorporated herein by reference.

A maximum S score and a mean S score, as described in the Nielson et al. reference, are obtained from each assembled contig. Table 6 sets forth the nucleotide range for each sequence of SEQ ID NO: 262-348 that encodes a corresponding amino acid sequence containing the signal peptide sequence and its cleavage site, the maximum S score and the mean S score obtained for each sequence.

A signal peptide or leader peptide is usually a segment of about 15 to 30 amino acids at the N terminus of protein that enables the protein to be targeted to a cell membrane or secreted from a cell. Generally, the signal peptide acts as an export label and is removed as the protein is secreted in its final form.

4.5 EXAMPLE 5

Novel Nucleic Acids

Using PHRAP (Univ. of Washington) or CAP4 (Paracel), a full length gene cDNA sequence and its corresponding protein sequence were generated from the assemblage. Any frame shifts and incorrect stop codons were corrected by hand editing. During editing, the sequence was checked using FASTY and/or BLAST against Genbank (i.e., dbEST version 117, gb pri 117, UniGene version 117, Genpept release 117). Other computer programs which may have been used in the editing process were phredPhrap and Consed (University of Washington) and ed-ready, ed-ext and gc-zip-2 (Hyseq, Inc.). The full-length nucleotide sequences, including splice variants resulting from these procedures are shown in the Sequence Listing as SEQ ID NOS: 349 - 351. The amino acids are SEQ ID NO: 354-356.

The homology for SEQ ID NO: 349 - 351 were obtained by a BLASTP version 2.0a1 19MP-WashU search against Genpept release 118, using BLAST algorithm. The results showed homologues for SEQ ID NO: 349-351 from Genpept. The homologues with identifiable functions for SEQ ID NO: 349-351 are shown in Table 7 below.

4.6 EXAMPLE 6

Novel Nucleic Acids

Using PHRAP (Univ. of Washington) or CAP4 (Paracel), a full length gene cDNA sequence and its corresponding protein sequence were generated from the assemblage. Any frame shifts and incorrect stop codons were corrected by hand editing. During editing, the sequence was checked using FASTY and/or BLAST against Genbank (i.e., dbEST version 118, gb pri 118, UniGene version 118, Genpept release 118). Other computer programs which may have been used in the editing process were phredPhrap and Consed (University of Washington) and ed-ready, ed-

ext and gc-zip-2 (Hyseq, Inc.). The full-length nucleotide sequence, including splice variants resulting from these procedures is shown in the Sequence Listing as SEQ ID NO: 352 and 353. The amino acid is SEQ ID NO: 357 and 358.

5 The homology for SEQ ID NO: 352 and 353 was obtained by a BLASTP version 2.0a1 19MP-WashU search against Genpept release 118, using BLAST algorithm. The results showed homologues for SEQ ID NO: 352 and 353 from Genpept. The translated amino acid sequences for which the nucleic acid sequence encodes are shown in the Sequence Listing. The homologues with identifiable functions for SEQ ID NO: 352 and 353 are shown in Table 7 below.

10 The nucleotide sequence within the sequences the codes for signal peptide sequences and its cleavage site can be determined using Neural Network SignalP V1.1 program (from Center for Biological Sequence Analysis, The Technical University of Denmark). The process for identifying prokaryotic and eukaryotic signal peptides and their cleavage sites are also disclosed by Henrik Nielson, Jacob Engelbrecht, Soren Brunak, and Gunnar von Heijne in the publication
15 "Identification of prokaryotic and eukaryotic signal peptides and prediction of their cleavage sites" Protein Engineering, Vol. 10, no. 1, pp. 1-6 (1997), incorporated herein by reference. A mean S score, as described in the Nielson et. al. was obtained for the polypeptide sequences. Table 9 shows the position of the predicted signal peptide in each of the polypeptides and the mean score associated with that signal peptide.

TABLE 1A

SEQ ID NO:	ACCESSION NO.	BLAST SCORE	P-VALUE	% IDENTITY	DESCRIPTION
6	Y41768	2360(835.8bits)	5.7e-245	93	Y41768 Human PRO286 protein sequence. Length = 1041
11	Y05069	1039(370.8bits)	5.5e-105	97	Y05069 Human PIGR-2 protein sequence. Length = 205
14	Y73475	135(52.6bits)	3.4e-09	52	Y73475 Human secreted protein clone ye7_1 protein sequence SEQ ID NO:172.
22	W40481	256(95.2bits)	2.4e-21	39	W40481 Human SH2 binding protein. Length = 503
74	R28150	138(53.6bits)	1.2e-08	41	R28150 Sugar beet chitinase 1. Length = 439

TABLE 1B

SEQ ID NO:	ACCESSION NO.	BLAST SCORE	P-VALUE	% IDENTITY	DESCRIPTION
5	NP_055659.1	389(142.0bits)	1.9e-34	87	KIAA0329 gene product [Homo sapiens] >dbj BAA20787.1 (AB002327) KIAA0329 [Homo sapiens]
6	AAF78036.1	2364(837.2bits)	3.6e-245	93	AF245703_1 (AF245703) toll-like receptor 8 [Homo sapiens] Length = 1041
7	AAF89682.1	537(194.1bits)	1.5e-51	98	(AF169968) DNA binding protein DESRT [Mus musculus] Length = 743
11	NP_006669.1	410(149.4bits)	4.2e-38	47	CMRF35 leukocyte immunoglobulin-like receptor; CMRF35 antigen [Homo sapiens] >sp Q08708 CM35_HUMAN CMRF35 ANTIGEN
13	BAB15450.1	649(233.5bits)	2.0e-63	96	(AK026332) unnamed protein product [Homo sapiens] Length = 258
22	CAB96828.1	618(222.6bits)	3.8e-60	99	(AL109658) dJ776F14.2 (novel immunoglobulin domains containing protein) [Homo sapiens]
74	CAB62280.1	148(57.2bits)	1.5e-09	41	(AJ242540) hydroxyproline-rich glycoprotein DZ-HRGP [Volvox carteri f. nagariensis]

TABLE 1C

SEQ ID NO:	ACCESSION NO.	BLAST SCORE	P-VALUE	% IDEN-TITY	DESCRIPTION
1	Z41384	874(137.2bits)	2.3e-34	65	Z41384 Human normal uterus tissue derived cDNA 60. Length = 1346
2	C32570	1175(182.3bits)	3.0e-47	94	C32570 Human secreted protein 5' EST, SEQ ID NO: 36645. Length = 263
3	Z52488	5037(761.8bits)	3.1e-302	96	Z52488 Human secreted protein clone ye2_1 nucleotide sequence SEQ ID NO:27.
6	Z34304	14243(2143.1bits)	0.0e+00	97	Z34304 Human PRO286 nucleotide sequence. Length = 4199
7	C09016	1460(225.1bits)	3.8e-59	81	C09016 Human secreted protein 5' EST, SEQ ID NO: 13091. Length = 470
8	Z24819	1502(231.4bits)	1.5e-62	99	Z24819 Human secreted protein gene 9 clone HMCFY13. Length = 883
10	A16628	2828(430.4bits)	5.1e-123	98	A16628 Human secreted protein clone ci52_2 nucleotide sequence SEQ ID NO:21.
11	X28250	2885(438.9bits)	4.0e-125	94	X28250 Human PIGR-2 coding sequence. Length = 1137
12	X83003	683(108.5bits)	1.9e-24	63	X83003 Human WRN genomic sequence. Length = 87,350
14	Z52560	1914(293.2bits)	1.5e-81	80	Z52560 Human secreted protein clone ye7_1 nucleotide sequence SEQ ID NO:171.
16	Z42365	1079(167.9bits)	6.8e-43	95	Z42365 Human 5' EST isolated from a cDNA library SEQ ID NO:124. Length = 249
18	X40516	1547(238.2bits)	3.7e-64	96	X40516 Human secreted protein 5' EST SEQ ID No: 116. Length = 334
21	T35033	362(60.4bits)	3.3e-09	72	T35033 HSV-1 IR-L (position 117156-117341) target sequence. Length = 186
22	A45057	333(56.0bits)	1.2e-06	57	A45057 Mouse secreted expressed sequence tag SEQ ID NO:1632. Length = 676
33	Z97376	328(55.3bits)	2.9e-08	73	Z97376 Human prostate cancer differentially expressed gene #237. Length = 483
37	X83003	349(58.4bits)	2.4e-09	63	X83003 Human WRN

SEQ ID NO:	ACCESSION NO.	BLAST SCORE	P-VALUE	% IDENTITY	DESCRIPTION
					genomic sequence. Length = 87,350
45	V88906	647(103.1bits)	8.7e-24	66	V88906 EST clone IA188. Length = 634
50	Z00475	506(82.0bits)	1.3e-16	71	Z00475 Human secreted protein cDNA encoding gene 66. Length = 2483
52	V88316	1365(210.9bits)	2.7e-56	99	V88316 EST clone EZ676. Length = 756
53	A42278	817(128.6bits)	5.7e-31	92	A42278 Human secreted expressed sequence tag SEQ ID NO:1018. Length = 205
54	X84971	585(93.8bits)	7.2e-21	73	X84971 Human secreted protein gene No. 39. Length = 1176
62	V86232	578(92.8bits)	2.0e-20	71	V86232 EST clone S70. Length = 362
63	C19606	1559(240.0bits)	1.1e-64	97	C19606 Human secreted protein 5' EST, SEQ ID NO: 23681. Length = 324
65	X79021	290(49.6bits)	4.1e-07	68	X79021 Human secreted protein gene 11 clone HSLCU73. Length = 798
74	Q76213	459(74.9bits)	6.5e-12	60	Q76213 HSV L/ST region. Length = 12,001
77	Z10752	560(90.1bits)	7.0e-19	63	Z10752 Genomic sequence of the human HKNG1 gene. Length = 72,604
85	C20378	480(78.1bits)	4.3e-15	82	C20378 Human secreted protein 5' EST, SEQ ID NO: 24453. Length = 176
87	Z14832	986(154.0bits)	9.0e-39	99	Z14832 Human gene expression product cDNA sequence SEQ ID NO:2301. Length = 300

SEQ ID NO:	ACCESSION NO	BLAST SCORE	P-VALUE	% IDENTITY	DESCRIPTION
1	AL138836.15	4093(620.2bits)	1.9e-177	96	AL138836 Human DNA sequence from clone RP11-88M19 on chromosome 9, complete sequence [Homo sapiens]
2	AK026357.1	3756(569.6bits)	6.5e-247	93	AK026357 Homo sapiens cDNA: FLJ22704 fis, clone HSI12602 Length = 1984
3	AK000399.1	10017(1509.0bits)	0.0	98	AK000399 Homo sapiens cDNA FLJ20392 fis, clone KAIA4653 Length = 2091
4	AK000812.1	732(115.9bits)	2.6e-26	98	AK000812 Homo sapiens cDNA FLJ20805 fis, clone ADSE02009 Length = 1586
5	AL137229.2	6231(941.0bits)	6.2e-318	99	CNS01DWK Human chromosome 14 DNA sequence *** IN PROGRESS *** BAC C-2246N19 of library CalTech-D from chromosome 14 of Homo
6	AF246971.1	15253(2294.6bits)	0.0	97	AF246971 Homo sapiens Toll-like receptor 8 (TLR8) mRNA, complete cds
7	AF169968.1	5798(876.0bits)	4.9e-256	82	AF169968 Mus musculus DNA binding protein DESRT (Desrt) mRNA, complete cds
10	AL023285.1	812(127.9bits)	3.1e-29	73	HS474A14 Human DNA sequence from clone 474A14 on chromosome 1q24.1-25.2 Contains EST, CA repeat, 5'UTR (tenascin-R), GSS,
11	X66171.1	611(97.7bits)	3.5e-32	63	HSCMRF35A H.sapiens CMRF35 mRNA, complete CDS Length = 1151
12	AL049745.9	4714(713.3bits)	5.3e-210	96	HSJ654H19 Human DNA sequence from clone 654H19 on chromosome 1p31.1-33 Contains ESTs, STSs, GSSs and CpG Islands, complete
13	AK026332.1	3269(496.5bits)	2.3e-282	98	AK026332 Homo sapiens cDNA: FLJ22679 fis, clone HSI10687 Length = 2587
14	AL137521.1	6823(1029.8bits)	0.0	95	HSM802253 Homo sapiens mRNA; cDNA DKFZp434D0218 (from clone DKFZp434D0218); partial cds
16	AC007565.1	2717(413.7bits)	9.3e-183	96	AC007565 Homo sapiens chromosome 19, cosmid R27656, complete sequence
18	AC002553.1	5064(765.9bits)	1.4e-277	94	AC002553 Homo sapiens chromosome 17, clone hCIT529I10, complete sequence
21	M24972.1	379(62.9bits)	5.1e-09	72	DDICTSRE D.discoideum CT-rich satellite rDNA, clone pCT8 Length = 210
22	AL109658.5	3342(507.5bits)	7.3e-233	94	HSJ776F14 Human DNA sequence from clone RP4-776F14 on chromosome

SEQ ID NO:	ACCESSION NO	BLAST SCORE	P-VALUE	% IDENTITY	DESCRIPTION
					20p12.2-13 Contains the 5' end of the FKBP1A gene for
23	AL109658.5	1768(271.3bits)	2.0e-72	97	HSJ776F14 Human DNA sequence from clone RP4-776F14 on chromosome 20p12.2-13 Contains the 5' end of the FKBP1A gene for
26	AC006370.2	4056(614.6bits)	9.1e-176	94	AC006370 Homo sapiens BAC clone RP11-292P9 from Y, complete sequence
31	AC005803.1	1790(274.6bits)	2.1e-73	100	AC005803 Homo sapiens chromosome 17, clone hRPK.214_C_8, complete sequence
33	AL035209.1	3943(597.7bits)	1.1e-170	98	HS7H11 Human DNA sequence *** SEQUENCING IN PROGRESS *** from clone 7H11, complete sequence [Homo sapiens]
37	AC004605.1	434(71.2bits)	3.7e-12	66	HUAC004605 Homo sapiens Chromosome 16 BAC clone CIT987SK-A-248F7, complete sequence
38	AL109753.9	3954(599.3bits)	3.7e-171	98	HSJ875J14 Human DNA sequence from clone RP5-875J14 on chromosome Xq13.1-21.1, complete sequence [Homo sapiens]
41	AC009116.7	1452(223.9bits)	3.8e-58	91	AC009116 Homo sapiens chromosome 16 clone RP11-477D3, complete sequence
43	AC004973.1	357(59.6bits)	7.0e-06	60	AC004973 Homo sapiens PAC clone RP5-1139I1 from Xq23, complete sequence
45	AL031287.3	3877(587.8bits)	1.1e-167	98	HS703H14 Human DNA sequence from clone 703H14 on chromosome 1q23.2-24.3 Contains 3' end of a novel gene, ESTs, CA
47	AC006038.2	3139(477.0bits)	2.4e-134	98	AC006038 Homo sapiens BAC clone RP11-299C5 from 2, complete sequence
49	AL121760.11	3123(474.6bits)	1.2e-133	97	HSDJ968J1 Human DNA sequence from clone RP5-968J1 on chromosome 20 Contains part of a novel gene similar to collagen
50	AK002135.1	506(82.0bits)	1.2e-15	71	AK002135 Homo sapiens cDNA FLJ11273 fis, clone PLACE1009338 Length = 2067
54	AC004782.1	1131(175.7bits)	1.2e-43	73	AC004782 Homo sapiens chromosome 5, BAC clone 205e20 (LBNL H170), complete sequence
55	AF125358.1	1940(297.1bits)	9.2e-86	95	F125350S09 Homo sapiens cytohesin 1 gene, exon 10, alternatively spliced
60	AL158141.14	1753(269.1bits)	9.8e-72	92	AL158141 Human DNA sequence from clone RP11-351K23 on chromosome X,

SEQ ID NO:	ACCESSION NO	BLAST SCORE	P-VALUE	% IDENTITY	DESCRIPTION
					complete sequence [Homo sapiens]
62	X03205.1	578(92.8bits)	5.4e-19	71	HSRRN18S Human 18S ribosomal RNA Length = 1869
64	Z98052.1	2326(355.0bits)	1.3e-97	98	HS505B13 Human DNA sequence from clone 505B13 on chromosome 1p36.2-36.3 Contains CA repeat and GSSs, complete sequence [Homo sapiens]
65	AC005630.1	1353(209.1bits)	1.1e-53	86	AC005630 Homo sapiens PAC clone RP5-1129D5 from 15, complete sequence
68	AC023510.16	1921(294.3bits)	2.5e-79	99	AC023510 Homo sapiens 12 BAC RP11-713N11 (Roswell Park Cancer Institute Human BAC Library) complete sequence
69	AC006430.22	1290(199.6bits)	8.0e-51	97	AC006430 Homo sapiens chromosome 9, clone RP11-525G7, complete sequence
70	AC004764.1	586(94.0bits)	5.0e-19	66	AC004764 Homo sapiens chromosome 5, P1 clone 255g5 (LBNL H61), complete sequence
72	AL078605.30	1626(250.0bits)	5.3e-66	91	HSJ894D12 Human DNA sequence from clone RP5-894D12 on chromosome 6q26-27. Contains part of the gene for a novel protein
74	AJ250235.1	2945(447.9bits)	1.2e-125	85	HSA250235 Homo sapiens FECH gene for ferrochelatase, exons 1-11 Length = 38,637
77	AC004470.1	589(94.4bits)	3.7e-19	66	AC004470 Homo sapiens Xp22 BAC GSHB-433024 (Genome Systems Human BAC library) complete sequence
78	AL121945.6	1687(259.2bits)	5.0e-69	99	HSDJ352G1 Human DNA sequence from clone RP3-352G1 on chromosome 6q21-22.2 Contains a GSS, complete sequence [Homo sapiens]
79	AL049715.25	610(97.6bits)	4.2e-20	74	HSJ646P11 Human DNA sequence from clone RP4-646P11 on chromosome 1, complete sequence [Homo sapiens]
80	AC005226.1	1573(242.1bits)	1.3e-63	98	AC005226 Homo sapiens PAC clone RP4-683L10 from 14q24.3, complete sequence
84	AL354829.8	1608(247.3bits)	3.4e-65	92	AL354829 Human DNA sequence from clone RP11-218B22 on chromosome 13, complete sequence [Homo sapiens]
85	AC021068.17	2772(422.0bits)	9.1e-118	96	AC021068 Homo sapiens 3 BAC RP11-48O22 (Roswell Park Cancer Institute Human BAC Library) complete sequence
87	AC009484.3	348(58.3bits)	2.8e-08	60	AC009484 Homo sapiens BAC

SEQ ID NO:	ACCESSION NO	BLAST SCORE	P-VALUE	% IDENTITY	DESCRIPTION
					clone RP11-313O11 from 2, complete sequence

Table 2

SEQ ID NO:	ACCESSION NO:	DESCRIPTION	P-VALUE	RAW SCORE	RESIDUE POSITION
6	PR00019B	LEUCINE-RICH REPEAT SIGNATURE	9.100e-10	11.36	26-40
6	PR00019B	LEUCINE-RICH REPEAT SIGNATURE	1.000e-09	11.36	102-116
6	PR00019B	LEUCINE-RICH REPEAT SIGNATURE	8.560e-09	11.36	239-253
8	PD01171A	COAT PROTEIN GLYCOPROTEIN VP2 V.	6.459e-09	14.02	12-38
11	DM01688I	2 POLY-IG RECEPTOR.	7.480e-10	14.97	70-118
11	DM01688J	2 POLY-IG RECEPTOR.	4.455e-09	14.69	23-60
13	BL00227E	Tubulin subunits alpha, beta, and gamma proteins.	9.695e-10	24.15	137-172
15	BL01288C	Uncharacterized protein family UPF0027 proteins.	7.500e-09	10.54	34-41
22	DM00031B	IMMUNOGLOBULIN V REGION.	5.215e-09	15.41	70-104
22	PD02870D	RECEPTOR INTERLEUKIN-1 PRECURSOR.	8.755e-09	15.74	86-121

Table 3

SEQ ID NO	ACCESSION NO.	PFAM MODEL NAME	PFAM SCORE	E-VALUE
6	LRR	PF00560	19.2	0.096
6	LRR	PF00560	9.0	48
6	LRR	PF00560	17.9	0.25
6	LRR	PF00560	18.0	0.22
6	LRR	PF00560	13.1	6.6
6	LRR	PF00560	10.7	27
6	LRR	PF00560	6.2	1.2e+02
6	LRR	PF00560	12.0	15
6	LRR	PF00560	5.5	1.6e+02
6	LRR	PF00560	0.1	9.7e+02
6	LRR	PF00560	8.1	66
11	ig	PF01812	27.1	7.4e-07
22	ig	PF01812	38.6	2.1e-10

TABLE 4

SEQ ID NO:	SIGNAL PEPTIDE POSITION	MEAN SCORE	CUTOFF	CONCLUSION
1	1-45	0.104	0.48	NO
2	1-63	0.176	0.48	NO
3	1-177	0.194	0.48	NO
4	1-29	0.604	0.48	YES
5	1-483	0.404	0.48	NO
6	1-123	0.105	0.48	NO
7	1-498	0.061	0.48	NO
8	1-43	0.120	0.48	NO
9	1-15	0.057	0.48	NO
10	1-53	0.330	0.48	NO
11	1-192	0.211	0.48	NO
12	1-25	0.444	0.48	NO
13	1-141	0.370	0.48	NO
14	1-83	0.346	0.48	NO
15	1-16	0.724	0.48	YES
16	1-75	0.242	0.48	NO
17	1-11	0.173	0.48	NO
18	1-37	0.534	0.48	YES
19	1-12	0.704	0.48	YES
20	1-22	0.618	0.48	YES
21	1-18	0.714	0.48	YES
22	1-43	0.076	0.48	NO
23	1-63	0.229	0.48	NO
24	1-26	0.816	0.48	YES
25	1-69	0.104	0.48	NO
26	1-17	0.743	0.48	YES
27	1-22	0.856	0.48	YES
28	1-18	0.777	0.48	YES
29	1-330	0.105	0.48	NO
30	1-22	0.897	0.48	YES
31	1-34	0.202	0.48	NO
32	1-73	0.227	0.48	NO
33	1-40	0.346	0.48	NO
34	1-53	0.215	0.48	NO
35	1-28	0.747	0.48	YES
36	1-26	0.246	0.48	NO
37	1-18	0.226	0.48	NO
38	1-25	0.850	0.48	YES
39	1-22	0.612	0.48	YES
40	1-44	0.152	0.48	NO
41	1-20	0.667	0.48	YES
42	1-22	0.902	0.48	YES
43	1-47	0.075	0.48	NO
44	1-26	0.147	0.48	NO
45	1-18	0.885	0.48	YES
46	1-40	0.410	0.48	NO
47	1-16	0.969	0.48	YES
48	1-14	0.775	0.48	YES
49	1-25	0.626	0.48	YES
50	1-33	0.571	0.48	YES
51	1-71	0.122	0.48	NO
52	1-33	0.758	0.48	YES
53	1-22	0.943	0.48	YES
54	1-37	0.618	0.48	YES
55	1-53	0.085	0.48	NO
56	1-19	0.939	0.48	YES
57	1-20	0.815	0.48	YES

58	1-16	0.866	0.48	YES
59	1-29	0.380	0.48	NO
60	1-16	0.141	0.48	NO
61	1-36	0.581	0.48	YES
62	1-56	0.345	0.48	NO
63	1-43	0.664	0.48	YES
64	1-16	0.416	0.48	NO
65	1-18	0.769	0.48	YES
66	1-62	0.514	0.48	YES
67	1-25	0.490	0.48	YES
68	1-29	0.556	0.48	YES
69	1-38	0.656	0.48	YES
70	1-40	0.821	0.48	YES
71	1-22	0.782	0.48	YES
72	1-28	0.411	0.48	NO
73	1-38	0.778	0.48	YES
74	1-62	0.152	0.48	NO
75	1-45	0.780	0.48	YES
76	1-23	0.652	0.48	YES
77	1-15	0.818	0.48	YES
78	1-17	0.764	0.48	YES
79	1-40	0.204	0.48	NO
80	1-18	0.667	0.48	YES
81	1-23	0.845	0.48	YES
82	1-34	0.318	0.48	NO
83	1-0	0.000	0.48	NO
84	1-43	0.419	0.48	NO
85	1-40	0.107	0.48	NO
86	1-21	0.693	0.48	YES
87	1-88	0.208	0.48	NO

TABLE 5

SEQ ID NO of nucleo- tide sequence	SEQ ID NO: of peptide sequence	SEQ ID NO: of contig nucleo-tide sequence	SEQ ID NO: of contig peptide sequence	SEQ ID NO: of full-length nucleo-tide sequence	SEQ ID NO: of full-length peptide sequence	SEQ ID NO in USSN 09/491,404 of contig nucleotide sequence	Priority Docket NO: Corresponding SEQ ID NO: in priority application	SEQ ID NO. of nucleotide sequence in USSN 60/250,583	SEQ ID NO. of peptide sequence in USSN 60/250,583
1	88	175	262			279		2574	11
2	89	176	263			1709		2587	24
3	90	177	264			1602		2603	40
4	91	178	265			3095		2621	58
5	92	179	266			453		2654	91
6	93	180	267			1149		2672	109
7	94	181	268			2976		2784	221
8	95	182	269	351	356	3792	785CIP2B _214	2826	263
9	96	183	270			2385		2834	271
10	97	184	271	353	358	2871	785CIP2C _23	2837	273
11	98	185	272			3565		2846	282
12	99	186	273			1081		2853	289
13	100	187	274	352	357	610	785CIP2C _2	2859	295
14	101	188	275			2155		2866	302
15	102	189	276			329		2871	307
16	103	190	277			1480		2872	308
17	104	191	278			2262		2877	313
18	105	192	279			823		2890	326
19	106	193	280			1681		2902	338
20	107	194	281			1310		2906	342
21	108	195	282			2478		2907	343
22	109	196	283			3612		2925	361
23	110	197	284			3612		2926	362
24	111	198	285			168		2947	383
25	112	199	286			1083		2949	385
26	113	200	287			550		2950	386
27	114	201	288			1082		2951	387
28	115	202	289			919		2952	388
29	116	203	290			826		2957	393
30	117	204	291			1372		2972	408
31	118	205	292			1808		2974	410
32	119	206	293			252		2984	420
33	120	207	294			1373		2987	423
34	121	208	295			3572		2990	426
35	122	209	296			2229		2995	431
36	123	210	297			2235		3003	439
37	124	211	298			1527		3004	440
38	125	212	299			3293		3006	442
39	126	213	300			2232		3007	443
40	127	214	301			780		3017	453
41	128	215	302			2234		3060	496
42	129	216	303			875		3061	497
43	130	217	304			2409		3066	502
44	131	218	305	350	355	3097	785CIP2B	3069	505

SEQ ID NO of nucleo- tide sequence	SEQ ID NO: of peptide sequence	SEQ ID NO: of contig nucleo-tide sequence	SEQ ID NO: of contig peptide sequence	SEQ ID NO: of full-length nucleo-tide sequence	SEQ ID NO: of full-length peptide sequence	SEQ ID NO in USSN 09/491,404 of contig nucleotide sequence	Priority Docket NO: Corresponding SEQ ID NO: in priority application	SEQ ID NO. of nucleotide sequence in USSN 60/250,583	SEQ ID NO. of peptide sequence in USSN 60/250,583
							_192		
45	132	219	306			917		3081	517
46	133	220	307			1309		3104	540
47	134	221	308			2304		3109	545
48	135	222	309	349	354	2391	785CIP2B _64	3113	549
49	136	223	310			1051		3123	559
50	137	224	311			3538		3148	584
51	138	225	312			3289		3155	591
52	139	226	313			2149		3156	592
53	140	227	314			3301		3163	599
54	141	228	315			176		3193	629
55	142	229	316			2393		3209	645
56	143	230	317			3093		3224	660
57	144	231	318			2228		3316	752
58	145	232	319			482		3357	793
59	146	233	320			2387		3360	796
60	147	234	321			3184		3402	838
61	148	235	322			3532		3412	848
62	149	236	323			3538		3429	865
63	150	237	324			2054		3628	1064
64	151	238	325			3758		3632	1068
65	152	239	326			1700		3675	1111
66	153	240	327			3292		3702	1138
67	154	241	328			2123		3706	1142
68	155	242	329			2219		3761	1197
69	156	243	330			3209		3768	1204
70	157	244	331			1123		3790	1226
71	158	245	332			3383		3838	1274
72	159	246	333			3530		3923	1359
73	160	247	334			874		3948	1384
74	161	248	335			2152		4143	1578
75	162	249	336			2390		4212	1647
76	163	250	337			3385		4257	1692
77	164	251	338			175		4271	1706
78	165	252	339			868		4380	1814
79	166	253	340			2221		4387	1821
80	167	254	341			1360		4453	1886
81	168	255	342			3384		4530	1961
82	169	256	343			2227		4555	1985
83	170	257	344			315		4591	2021
84	171	258	345			1766		4722	2151
85	172	259	346			3103		4847	2275
86	173	260	347			1682		5012	2440
87	174	261	348			2153		5126	2554

Table 6

SEQ ID NO:	Predicted beginning nucleotide location corresponding to first amino acid residue of amino acid sequence	Predicted end nucleotide location corresponding to first amino acid residue of amino acid sequence	Amino acid segment containing signal peptide (A=Alanine, C=Cysteine, D=Aspartic Acid, E=Glutamic Acid, F=Phenylalanine, G=Glycine, H=Histidine, I=Isoleucine, K=Lysine, L=Leucine, M=Methionine, N=Asparagine, P=Proline, Q=Glutamine, R=Arginine, S=Serine, T=Threonine, V=Valine, W=Tryptophan, Y=Tyrosine, X=Unknown, *=Stop codon, /=possible nucleotide deletion, \=possible nucleotide insertion)
262	33	239	MCIELCIIFPVMSSPSFFILVSENNNNDLFLIL MVLLLVSLGLTLAVLVDWLQLEDLKMASPIC LGP*
263	2971	3261	MMQLLFPLPLWGIIPFHLHCCDIVCPLSQVEG GILRLPPALVHSIFLLHAACVMISCKAFNIKSP LCVRPHVERKTCLREEVCCVSPFSSPQICVS*
264	1095	1244	MSRFFIFCCLRHFSYFSDFAVLFLGALEHLKY QLAVGHSVLSESTDGNV*
265	540	388	MAYRGQLLAGFTFDVSACLWTSWRTALTEC VAWGICPLGWVVPVLGPVDG*
266	129	320	MHRGVLVTLLKITVLKSMHRGILVTLLKITIL KSMHRGVLDITLLKITILKSMHRGVLVTLLKIT
267	3	608	MVMLAALAHHLFYWDVWFIYNVCLAKVKG YRSLSTSQTFYDAYISYDTKDASVTDWVINEL RYHLEESRDKNVLLCLEERDWDPLAIDNL MQSINQSKKTVFVLTKKYAKSWNFKTA FYLA LQRLMDENMDVIIIFILLEPVLQHSQYLRLRQR ICKSSILQWPDNPKAEGFLWQTLRNVVLTEN DSRYNNMYVDSIKQY*
268	954	694	MLFWLIKVSCSFSCSDETSAA SWGFGAFSFSF LLGISCLMRLVPDITFVLF SFSCELFSCFRGLI GGRGLSSSPLINLSYGRINLS*
269	107	1135	MLQGHSSVFQALLGTFFTWGMTAAGAALVF VFSSGQRRILDGSLGFAAGVMLAASYWSLLA PAVEMATSSGGFGAFAFPVAVGFTLGAAFV YLADLLMPHLGAAEDPQTALALNFGSTLMK KKSDPEGPALLFPESEL SIRIGRAGLLSDKSEN GEAYQRKKAATGLPEGPAVPVPSRGNLAQP GGSSWRIALLILAITHNVPEGLAVGVGFGAI EKTASATFESARNLAIGIGIQNFPEGLAVSLPL RGAGFSTWRAFWYGQLSGMVEPLAGVFGAF AVVLAEPILPYALAFAGAMVYVVMDDIPE AQISGNGKLASWASILGFVVMMSLDVGLG*
270	160	357	MKCKLIPVCPFLRLNTQPLLIISYGIFLHIFRDF SYIHRVRERHSVFLSVGQQWCPELTRSIFLLN
271	147	773	MGLGARGAWAALLGTLQVLALLGAAHESA AMAASANIENSGLPHNSSANSTETLQHVPSD HTNETSNSTVKPPTSVASDSSNTTVTTMKPTA ASNTTTPGMVSTNMTSTTLKSTPKTTSVSQNT SQISTSTMTVTHNSSVTSAASSVTITTTMHSEA KKGSKFDTGSFVGIVLTGLVLSILYIGCKMY YSRRGIRYRTIDEHDAII*

SEQ ID NO:	Predicted beginning nucleotide location corresponding to first amino acid residue of amino acid sequence	Predicted end nucleotide location corresponding to first amino acid residue of amino acid sequence	Amino acid segment containing signal peptide (A=Alanine, C=Cysteine, D=Aspartic Acid, E=Glutamic Acid, F=Phenylalanine, G=Glycine, H=Histidine, I=Isoleucine, K=Lysine, L=Leucine, M=Methionine, N=Asparagine, P=Proline, Q=Glutamine, R=Arginine, S=Serine, T=Threonine, V=Valine, W=Tryptophan, Y=Tyrosine, X=Unknown, *=Stop codon, /=possible nucleotide deletion, \=possible nucleotide insertion)
272	120	434	MWLPPALLLLSLSGCFSIQGPESVRAPEQGS TVQCHYKQGWETYIKWWCRGVRWDTCKILI ETRGSEQGEKSDRVSIDKNQKDRTFTVTMEG LRRDDAXVYWCG
273	14	196	MKFHLSFFSLKRAIFYICAKADKISGGYLYKC RTVSYSGKNVRSGVKISGFLSACIISYL*
274	140	586	MHMLNGALLALLFPVVNTRLLPFELEIYYIQH VMLYVVPYLLWKGGAYTPEPLSSFRWALLS TGLMFFYHFSVLQILGLVTEVNLNNMLCPAIS DPFYGPWYRIWASGHQTLMTMTHGKLVLFS YMAGPLCKYLLDLLRLPAKKID*
275	1095	322	MRWIAFAVMIVLALIRIGHGQGEHPPPLADFS GVRNLFVCVYSFMCQHSLPSLITPVSSKRHL TRLVFLDYVLILAFYGLLSFTAIFCFRGDSLM DMYTLNFARCDVVGLAAARLFLGLFPVFTIST NFPPIAVTLRNNWKTFLFHREGGTYPWVVDV VFPTITLVPPVLVAFCTHDLES LGITGAYAG TGIQYVIPAFVLVYHCRRDTQLAFGCGVSNKH RSPFRHTFWVGVLLWAFSCFIFVTANIILSET KL*
276	35	337	MALALAAVVCGWVVDRETWPVPMPCNKGG RACNLEMGMWLNHCEVSKWQQPPSGALC CSLAPLQSIFFPAKVMFKNGSWTVLLPCSEF PIGFPSHLE*
277	706	951	MRCGWGPLGCLGTGAPAGWMVLGSPRSQQL RARWSRASLSAFGWEIRLRPEGPKAPRQLL VALESETLGVHGGATPLHCL*
278	79	273	MNNSPLALFSWEGWKKFLVLLPAFCITPSQST SFSNIVPTTYQYCTPGSCQAVHSNAVGGNTW K*
279	1121	1387	MFSCFFSTSLATSVSLEAQSCFAWPLIVSFPQG SLLSPFLMSYNLSHLIYSGELNGRLYAENSQI CICSPAFTKLYLHIFADLITS*
280	12	182	MCLAHLFKLLVYFNRSNSWVQAPFVLETTTG LFSSSVSLICILNLFCKQNLNNNFL*
281	125	319	MLPPLCWCCVRTMTCCIGTSTGMDGRPPSPW RRIPCWTQTCSCRNSATPSSPHFLHTSRWGP MY
282	6	239	MTARFLICLFQTTMYAEFNLGQRRWQTRNAP NLSGWLGLAGAAPWQGRISPMLGTKVSLCN LSEESLAPLAKHTPRA*
283	695	877	MSPTGLLVVFAPVVLGLKAITLAALLLALATS RRSPGQEDVKTTGPAGAMNTLAWSKGQE*

SEQ ID NO:	Predicted beginning nucleotide location corresponding to first amino acid residue of amino acid sequence	Predicted end nucleotide location corresponding to first amino acid residue of amino acid sequence	Amino acid segment containing signal peptide (A=Alanine C=Cysteine, D=Aspartic Acid, E=Glutamic Acid, F=Phenylalanine, G=Glycine, H=Histidine, I=Isoleucine, K=Lysine, L=Leucine, M=Methionine, N=Asparagine, P=Proline, Q=Glutamine, R=Arginine, S=Serine, T=Threonine, V=Valine, W=Tryptophan, Y=Tyrosine, X=Unknown, *=Stop codon, /=possible nucleotide deletion, \=possible nucleotide insertion)
284	695	877	MSPTGLLVVFAPVVLGLKAITLAALLLALATS RRSPGQEDVKTTGPAGAMNTLAWSKGQE*
285	241	438	MFFWRLILYSSPEITVCLHLFTSSGLKMQHL RSHCHLFRQALFLCFSDTTVMGFFLSYWWQF SV*
286	130	279	MWSVTSTIFICRLLIVRLLGNTAVRTSVVFLPH KAGRHWEKSTSLVSGG*
287	88	276	MWADSIASLLWPHQSLQLWHHPHLANKN MGVPPPTTCKPWSTVAQKFADYIPFMTTWPP LG
288	25	534	MRL LHCKTLHIVLFTLLYKILMDHQNLSEHV LCMVLYLIELGLENSAEEESDEEASVGGPERC HDSWFPGSNLVSNMRHFINYVRVRVPETAPE VKRDSPASTSSDNLGSLQNSGTAQVFSLV AER RKKFQEIINRSSEANQVVRPTTSSKWSAPGS APQLTTAIFGN*
289	102	308	MKMFQMLLTSSFCSLSHLQSCQHISFLSISNHS KIFLYLQPTCYLYLPPLPLFSRSWHWNLRVHI CSP*
290	785	1090	MCVAACFSLVAWSILQWGKRKYPEGNSSWQ IKEKVWRFSTAFCSVNEWKFADILSMADHLK KCSYNVVEKREEAIPLPCMCVTRELTKEGRSL RSVLKPVL*
291	737	940	MCTFRGLLTGLLTFPLFSPVLYFCNKFPPNKTN MFLLCFCKNYFLSTVFFIFLRQSFVLVAQTGV QGV*
292	342	656	MKGILFFFFWKG VYFSPSLKPRGEIWNCPQP WGE GGP IGGKIKNGGVFSGREFFPTMEKKKF PPRAKTKINPPRKMGAQRRPTPKWPTRQGP NRSPKKGKRYP
293	79	363	MPWVLGCTPFIALAYFFLWFLPPFTSLRGLW YTTFYCLFQALATVPYTALTMLLTPCPRERDS ATA YRMTVEMAGTLMGATVHGLIVSGAHRP HR
294	279	434	MAVEPLL AHFLRWSWLSARDFYSLGNVDPA LWVPCFFLLFLLITDNNDS*
295	196	351	MCSVTCGVLFALSGLLYSSPSPHWNRPSRIA VYLMCLTKYCTGSSAASCQ*
296	460	630	MPACCYRPCLLQPISLLNILLMMRKPSQEVIN DTPKAGKWLSRYLDSGLFYSCACG
297	119	382	MWSWHVQLQVSAPLHLLCLHFPPAHRIYM PFPSPKRAPAMLNKG IHMQGMSSVSWKGEA KFSFHHQ R VAFNIYTRQAFALLVLLN*

SEQ ID NO:	Predicted beginning nucleotide location corresponding to first amino acid residue of amino acid sequence	Predicted end nucleotide location corresponding to first amino acid residue of amino acid sequence	Amino acid segment containing signal peptide (A=Alanine, C=Cysteine, D=Aspartic Acid, E=Glutamic Acid, F=Phenylalanine, G=Glycine, H=Histidine, I=Isoleucine, K=Lysine, L=Leucine, M=Methionine, N=Asparagine, P=Proline, Q=Glutamine, R=Arginine, S=Serine, T=Threonine, V=Valine, W=Tryptophan, Y=Tyrosine, X=Unknown, *=Stop codon, /=possible nucleotide deletion, \=possible nucleotide insertion)
298	88	243	MQVSGPRPQLFLPSVFFVLLFSYFTTETTQWT VVILALNSKLSFKEIETIF*
299	78	263	MFMPGTVLRILLALPYLILTKQVQFFLFSDEIM AWKVVPAGLELSAVTPDSTLFNHYTILS*
300	142	390	MQVKFILKYIISFLWKTVTANGETVNMSLLY IFTTMMEMRKKSEVGLHLPISILKPFFTIVLDEKI VTGQVWGGELFLLFCKD*
301	97	273	MPELPTWVLALLPHPVLLIDSGELEAFEQIC RSTLKAVWHSVHGAMSVCFICFTFCH*
302	34	279	MRIVRRMCMWSAGPAPATVCAVMVAAPKSP QSPPRWACVYSLIGCHSSDPFSVYFSGISWRDI SLSLYSMAQESQNQSILK*
303	159	407	MCPLLVIYKILVFAAMFFFSQGSQVEIRSHEG EHCVGTVHLLSHFLYSKNNPVFYKGNTSFIFE TMEEDSLSSLAERSGSCM*
304	347	700	MPQFPVAFGIMFTYFTLAHKVLHSQASACLF IICFFPTCTLHFSQVGSHAAPWMGHDALCLRV FLYRLPCEKPSPSAHMVTGSGVLEGPLCALALS SFPPGATLHLSCLSLKRAVFFY
305	350	568	MSWRTRSMHTHISVSFKGKIRPTSAYLLFLF FFCYGVSLCCPGWSEVVARSRH LASSASRVH AILLPQNPE*
306	110	250	MLSTLSIGTSLMLIIVVSDSWSYSSNSPAMFGS DAGFIPSNCFIFAF*
307	625	906	MDPPCPWLHPAAWPLQTPLALPLLGTGSSPM PIFRWRPPVHLLSMAQGPSFLAGAARGDKAK GAPRRHGAFALTRWAYPIRALNLLGGRQT W*
308	145	306	MILVSLILIVEPLFASLTPLSLCFECVVFLNVG QHLT DQTFSLNGLLFLSNS*
309	19	222	MSPLLPLSYKL VLCFPTPNGVVTHGEQNAST DIEHGLKTILIKPPARILKRKTEGEESNRLTLPT T*
310	273	533	MGPVSGCWHMSLCLRVYLALDPAHQELMPP GSSLQPITLGIGIEILQPPTLEVGNSEALSVP SRRTPRTELTPWPTVLTGFLINTL*
311	13	171	MLTCVPERLFQCHHLIRMTCLFMILEFRLFKY DSNLCSHVIINHPQVQGRQR*
312	97	249	MWGAPALQCIVFFRWTRSKCLPDTGNVCTKT QRKKAAGRLGVAGGIALGL*
313	126	308	MSLRIRAARNWARDVOKLWTTVVLLVLILIRS AVNLLINSRTEDKSLQLVLYQSVIICFP*
314	34	210	MVWHVRKSSFWLLQLFSFISCHSVISVSPVH

SEQ ID NO:	Predicted beginning nucleotide location corresponding to first amino acid residue of amino acid sequence	Predicted end nucleotide location corresponding to first amino acid residue of amino acid sequence	Amino acid segment containing signal peptide (A=Alanine, C=Cysteine, D=Aspartic Acid, E=Glutamic Acid, F=Phenylalanine, G=Glycine, H=Histidine, I=Isoleucine, K=Lysine, L=Leucine, M=Methionine, N=Asparagine, P=Proline, Q=Glutamine, R=Arginine, S=Serine, T=Threonine, V=Valine, W=Tryptophan, Y=Tyrosine, X=Unknown, *=Stop codon, /=possible nucleotide deletion, \=possible nucleotide insertion)
			VPWTQCAVIPPYTSCPKLFAIQGGRF*
315	146	388	MGGFKVNLVFKVKAEGSPLCWLKLACLGAW LLSLLISQKSDEQLCFGLLTWNFSTSDSILVWF VGPRAGTQSKPVVSYKF*
316	110	265	METSSAFTNPLLVCFLALLHSVMNITYTPPKK KNENCSKPLILTSSLGTVQ*
317	457	675	MCAFLLPFKLLFFLEISLAMKSHFPFTLLILSR VLLKKTLYVLKLGWLITPSNDLTSVFTLMIH RQNQKHF*
318	260	51	MPTLLQVMSWMLSFQTQTLQLESCTCALHIV GAWKVPYPLFSRVLICQVKILSTSISQEKVFRT ESRTE*
319	38	175	MCRALLLLCSPNSSFQWLPLPVHPHTTIRYR SYNMVPVKLTNVQ*
320	77	244	MLFLHIAECSFLRLKVAFPSSLNFQPLAQFLA HILEVFYKCLWKKGVQVFNFLAN*
321	384	211	MPLDTDAILHRTAEWYVLCITCFMYVLYVP YLRSLILLEYLHLLPFEILIQANAG*
322	155	304	MATRSKGAFINCYIILLTFLMIRTFYNLMEY YCPTLLIRKLMSNTKIL*
323	13	171	MLTCVPERLFQCHHLIRMTCLFMILEFRLFKY DSNLCSHVIINHPQVQGRQR*
324	173	397	MDFLSRLMLLRMCKCVTATYQYIRRSFLNL VPLLQTLSTAHSVLLRPALSSLVKMEDSQA LSLSLEPESAF*
325	268	450	MFCLWNQWVVTARLLVSWLSHAQRQPCPL SLFCGRRNPLAWTIFGWKHQPLTSDCHFQM*
326	63	239	MTTSSLVLPPLFVLKQRFYPPLYLHPYSICQ HVSILVKIVWTWGSEVPTLTGTIEIGT*
327	141	359	MLAWRLLCPWGPGLPTTTARSGERTERRERV RTASPRKILFKTQPPRGSSDRCPWGRQCLHG TGTCHMPNR*
328	217	357	MTSRPHFFRYLCSLPPLLFPLLXQSQLLPGSPL PIALQSRVGSLLA*
329	99	386	MLPSFLPQSLGNLIHTLGFLLIHKYMSAFKNR TDEFMNMGMQPYIKSPYRLSMSQISLKFDLS QTDLILPHKFYSPSSFTVMLFYSGRLSHKP
330	99	248	MQAWRSFVMGVEVLMYIVAVRCRAVFATSL WQPWCYTRAGGQFNVSQAR*
331	11	244	MVVLIVRAYNHYLCCSSSLYLVLILLVTV YLMLTTSSYNDVSLVIWIASSFASSKFFRKGL REYSYFMNFLARS*
332	71	349	MLEWPLLGGILPMIPLPPLPALVWVPIGLTHC

SEQ ID NO:	Predicted beginning nucleotide location corresponding to first amino acid residue of amino acid sequence	Predicted end nucleotide location corresponding to first amino acid residue of amino acid sequence	Amino acid segment containing signal peptide (A=Alanine, C=Cysteine, D=Aspartic Acid, E=Glutamic Acid, F=Phenylalanine, G=Glycine, H=Histidine, I=Isoleucine, K=Lysine, L=Leucine, M=Methionine, N=Asparagine, P=Proline, Q=Glutamine, R=Arginine, S=Serine, T=Threonine, V=Valine, W=Tryptophan, Y=Tyrosine, X=Unknown, *=Stop codon, /=possible nucleotide deletion, \=possible nucleotide insertion)
			PWSPFVFPASLDGIFYNSRSLDGKSPPLRPEKW SPWSWFSRLPGHGLPKEGGQRKREVWA*
333	163	360	MMLWQVYPGPSAAVLCLFLHPPWSRSTAVE REKRQKDGRGQRM LLPQPQCLMSSCCLVDV QSLTG*
334	61	243	MFFCLTRQSLLCTLLMLKRCIFFSYCVICRA KSFEFLTSEITFPDKRAKQCLFKLFSGT*
335	229	387	MGNTDILLLLSLFCFSYELVAGKTKAQFGVPF AEFSVFLILENTACRFLYI*
336	146	352	MSILVVS AFLANLWLLMTISTSQMLNMTKIT YLVLFLHLSALRIGSTPHSFLLSYHLGTHFSL FHMNS
337	308	72	MFVVFVSIHTELVPILRPLCLLYCCPDSCSVPRPL YSLKYLLLNDFPELQIHMSSFSQSLHYILSYF FHSICHILLVL*
338	362	204	MMRVIIWFRISKGTQFQHSTTKCDVCFRVFL LSNCSFLSLNYKLTSDFIY*
339	88	276	MQMVVPRLLSVPQLLNTAPLFLPWEKTVKTQ YSGIIFKFKSRIETAEKSIGDTERIQPSQI*
340	103	282	MLLPVFLLYLSQDLADSRAPAHCSVNTDLHL KWGSLCVLSHFQVDLPVNPICEHICRCP*
341	53	190	MNLEHVIVSLLTFYRVLLYKEIIGLHHCFQHF HVNAFLLSPLPPS*
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347	101	316	MPLLYIICLRQLVLFHSHKCHSQHSCRAGGIQY SMHVSFLSSPINYDNGFLVSPTFPLHVKLSFL KYSFKCI
348	823	1002	MGPKRGLFFFIFFLDTEPSVLGGGGGGQYGLT RTHLWRQGASYLTLLRNGTQSGPLAHL*

Table 7

SEQ ID NO:	ACCESSION NO.	SMITH-WATERMAN SCORE	% IDENTITY	DESCRIPTION
349	M84913	59	36	Antirrhinum majus DEL
350	U11271	110	71	Homo sapiens thromboxane A2 receptor
351	AE003824	696	54	Drosophila melanogaster CG13189 gene product
352	X85236	81	29	Trimorphomyces papilionaceus cob
353	AF068065	166	29	Cryptosporidium parvum GP900; mucin-like glycoprotein

Table 8

SEQ ID NO:	ACCESSION NO:	DESCRIPTION	P-VALUE	RAW SCORE	RESIDUE POSITION
352	BL01253	Type I fibronectin domain proteins	6.894e-07	14.35	55-94
353	PF00624	Flocculin repeat proteins	8.893e-09	13.62	53-108

Table 9

SEQ ID NO:	SIGNAL PEPTIDE POSITION IN AMINO ACID SEQUENCE	maxS (MAXIMUM SCORE)	meanS (MEAN SCORE)
352	1-18	0.971	0.925

5

WHAT IS CLAIMED IS:

1. An isolated polynucleotide comprising a nucleotide sequence selected from the group consisting of SEQ ID NO: 1-87, 175-261 or 349-353, a mature protein coding portion of SEQ ID NO: 1-87, 175-261 or 349-353, an active domain coding portion of
5 SEQ ID NO: 1-87, 175-261 or 349-353, and complementary sequences thereof.
2. An isolated polynucleotide encoding a polypeptide with biological activity, wherein said polynucleotide hybridizes to the polynucleotide of claim 1 under stringent hybridization conditions.
- 10 3. An isolated polynucleotide encoding a polypeptide with biological activity, wherein said polynucleotide has greater than about 90% sequence identity with the polynucleotide of claim 1.
- 15 4. The polynucleotide of claim 1 wherein said polynucleotide is DNA.
5. An isolated polynucleotide of claim 1 wherein said polynucleotide comprises the complementary sequences.
- 20 6. A vector comprising the polynucleotide of claim 1.
7. An expression vector comprising the polynucleotide of claim 1.
8. A host cell genetically engineered to comprise the polynucleotide of claim 1.
- 25 9. A host cell genetically engineered to comprise the polynucleotide of claim 1 operatively associated with a regulatory sequence that modulates expression of the polynucleotide in the host cell.
- 30 10. An isolated polypeptide, wherein the polypeptide is selected from the group consisting of:

- 5
- (a) a polypeptide encoded by any one of the polynucleotides of claim 1;
 - (b) a polypeptide encoded by a polynucleotide hybridizing under stringent conditions with any one of SEQ ID NO: 1-87, 175-261 and 349-353; and
 - (c) a polypeptide comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 88-174, 262-348 and 354-358; the mature protein portion thereof, or the active domain thereof.
- 10
11. A composition comprising the polypeptide of claim 10 and a carrier.
12. An antibody directed against the polypeptide of claim 10.
- 15 13. A method for detecting the polynucleotide of claim 1 in a sample, comprising:
- a) contacting the sample with a compound that binds to and forms a complex with the polynucleotide of claim 1 for a period sufficient to form the complex; and
 - b) detecting the complex, so that if a complex is detected, the
- 20 polynucleotide of claim 1 is detected.
14. A method for detecting the polynucleotide of claim 1 in a sample, comprising:
- a) contacting the sample under stringent hybridization conditions with nucleic acid primers that anneal to the polynucleotide of claim 1 under such
- 25 conditions;
- b) amplifying a product comprising at least a portion of the polynucleotide of claim 1; and
 - c) detecting said product and thereby the polynucleotide of claim 1 in the sample.
- 30

15. The method of claim 14, wherein the polynucleotide is an RNA molecule and the method further comprises reverse transcribing an annealed RNA molecule into a cDNA polynucleotide.

5 16. A method for detecting the polypeptide of claim 10 in a sample, comprising:

a) contacting the sample with a compound that binds to and forms a complex with the polypeptide under conditions and for a period sufficient to form the complex; and

b) detecting formation of the complex, so that if a complex formation
10 is detected, the polypeptide of claim 10 is detected.

17. A method for identifying a compound that binds to the polypeptide of claim 10, comprising:

a) contacting the compound with the polypeptide of claim 10 under
15 conditions sufficient to form a polypeptide/compound complex; and

b) detecting the complex, so that if the polypeptide/compound complex is detected, a compound that binds to the polypeptide of claim 10 is identified.

18. A method for identifying a compound that binds to the polypeptide of claim 10,
20 comprising:

a) contacting the compound with the polypeptide of claim 10, in a cell, under conditions sufficient to form a polypeptide/compound complex, wherein the complex drives expression of a reporter gene sequence in the cell; and

b) detecting the complex by detecting reporter gene sequence
25 expression, so that if the polypeptide/compound complex is detected, a compound that binds to the polypeptide of claim 10 is identified.

19. A method of producing the polypeptide of claim 10, comprising:

a) culturing a host cell comprising a polynucleotide sequence selected
30 from the group consisting of a polynucleotide sequence of SEQ ID NO: 1-87, 175-261 and 349-353, a mature protein coding portion of SEQ ID NO: 1-87, 175-261 or 349-353,

an active domain of SEQ ID NO: 1-87, 175-261 or 349-353, complementary sequences thereof and a polynucleotide sequence hybridizing under stringent conditions to SEQ ID NO: 1-87, 175-261 or 349-353, under conditions sufficient to express the polypeptide in said cell; and

- 5 b) isolating the polypeptide from the cell culture or cells of step (a).
20. The isolated polypeptide of claim 10 comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 88-174, 262-348 or 354-358, the mature protein portion thereof, or the active domain thereof.
- 10 21. The polypeptide of claim 20 wherein the polypeptide is provided on a polypeptide array.
- 15 22. A collection of polynucleotides, wherein the collection comprising the sequence information of at least one of SEQ ID NO: 1-87, 175-261 and 349-353.
- 20 23. The collection of claim 22, wherein the collection is provided on a nucleic acid array.
24. 24. The collection of claim 23, wherein the array detects full-matches to any one of the polynucleotides in the collection.
- 25 25. The collection of claim 23, wherein the array detects mismatches to any one of the polynucleotides in the collection.
26. 26. The collection of claim 22, wherein the collection is provided in a computer-readable format.

27. A method of treatment comprising administering to a mammalian subject in need thereof a therapeutic amount of a composition comprising a polypeptide of claim 10 or 20 and a pharmaceutically acceptable carrier.
- 5 28. A method of treatment comprising administering to a mammalian subject in need thereof a therapeutic amount of a composition comprising an antibody that specifically binds to a polypeptide of claim 10 or 20 and a pharmaceutically acceptable carrier.
- 10 29. A method of detecting bone marrow cells or tissues in a sample comprising:
- a) contacting the sample with a compound that binds to and forms a complex with the polynucleotide of claim 1 for a period sufficient to form a complex; and
 - b) detecting the complex, so that if a complex is detected, the polynucleotide of claim 1 is detected
- 15 wherein the presence of the polynucleotide of claim 1 indicates the presence of bone marrow cells or tissues.
30. A method for detecting bone marrow cells or tissue in a sample comprising:
- a) contacting the sample with a compound that binds to and forms a complex with the polypeptide under conditions and for a period sufficient to form a
- 20 complex; and
- b) detecting formation of the complex so that if a complex is detected, the polypeptide of claim 10 is detected,
- wherein the presence of the polypeptide of claim 10 indicates the presence of bone marrow cells or tissues in a sample.

SEQUENCE LISTING

<110> Hyseq, Inc.
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 Bryan J. Boyle
 Y. Tom Tang
 Chenghua Liu
 Vinod Asundi
 Ping Zhou
 Jie Zhang
 Radoje T. Drmanac

<120> NOVEL BONE MARROW NUCLEIC ACIDS AND POLYPEPTIDES

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<213> Homo sapiens

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<210> 10

<211> 771

<212> DNA

<213> Homo sapiens

<400> 10

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<210> 11

<211> 1174

<212> DNA

<213> Homo sapiens

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<211> 1086

<212> DNA

<213> Homo sapiens

<400> 12

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 <213> Homo sapiens

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 <211> 2403
 <212> DNA
 <213> Homo sapiens

<400> 14

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<210> 15

<211> 926

<212> DNA

<213> Homo sapiens

<400> 15

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<210> 16

<211> 1460

<212> DNA

<213> Homo sapiens

<400> 16

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<210> 17

<211> 953

<212> DNA

<213> Homo sapiens

<400> 17

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<210> 18
 <211> 1968
 <212> DNA
 <213> Homo sapiens

<220>
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<400> 18						
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<210> 19
 <211> 1235
 <212> DNA
 <213> Homo sapiens

<220>
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 <222> (1)...(1235)
 <223> n = a,t,c or g

<400> 19

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<210> 20

<211> 333

<212> DNA

<213> Homo sapiens

<400> 20

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cccactgtta	ctctttgatg	cttctctccc	tggtgtgggt	ttgtgttagg	acgatgacat	180
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cctgctggac	acagacatgc	tcatgtcgga	attcagcgac	accctcttct	ccacactttc	300
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<210> 21

<211> 1608

<212> DNA

<213> Homo sapiens

<400> 21

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ctagcctcca	gttataatgt	tctagaagg	gcagaatttc	tctcgtgggt	cagcccttg	1560
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<210> 22
 <211> 1245
 <212> DNA
 <213> Homo sapiens

<400> 22

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cagggagcac	actggaacct	accactgtgt	gaggtttgat	ggtttgagt	agcgactcag	480
aaatgaaatc	ggatgaaggc	acctcagtc	cttgtgaagg	gagctgggga	ccctgaacca	540
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<210> 23
 <211> 374
 <212> DNA
 <213> Homo sapiens

<400> 23

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aagctaaaa	gaactccac	gtacagacac	tctccatgtc	accagtttat	ggggtgtttc	300
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gttttttaag	cacg					374

<210> 24

<211> 569
 <212> DNA
 <213> Homo sapiens

<400> 24
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<210> 25
 <211> 842
 <212> DNA
 <213> Homo sapiens

<400> 25
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 ggttcctctc aggttttaag tacagtgact ctgtgatcct cttcagcttt ggtgtgatgg 780
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 tt 842

<210> 26
 <211> 915
 <212> DNA
 <213> Homo sapiens

<400> 26
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<210> 27
 <211> 863
 <212> DNA
 <213> Homo sapiens

<400> 27						
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<210> 28
 <211> 980
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <222> (1) ... (980)
 <223> n = a,t,c or g

<400> 28						
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<210> 29

<211> 2199

<212> DNA

<213> Homo sapiens

<400> 29

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<210> 30

<211> 648

<212> DNA

<213> Homo sapiens

<400> 30

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ggcagggttt	tttgaattaa	aaacaagtgt	ccaaggaagt	tgcccagatg	agcagtacta	360
ggtcatgctg	gtgggctgaa	gctggagttt	ggacctgacc	ctcaaacaca	ggtgcatgtg	420
cacatttcgt	gggtccctta	ctgggctttt	gacttttccc	ttattttctc	ctgtgcttta	480
tttctgtaac	aaatttccca	ataaaaacca	catgttctct	ttatgttttt	gtaaaaatta	540
tttcttaagt	actgtttata	aagtttttgt	gagacaaggt	ttggtttttg	ctgcccacac	600
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<210> 31
 <211> 358
 <212> DNA
 <213> Homo sapiens

<400> 31
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 accaagcctc agaggaggaa aaatgcttca gagaggctgc aatgactggg ttttgccatg 180
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 tgctgagcac tgccactggt gccctgattc aaggcccaag cttgggaaac attgtttctg 300
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<210> 32
 <211> 474
 <212> DNA
 <213> Homo sapiens

<400> 32
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 gcttttcctg cttgatatac cacaggtaag tgtgggcagt agcccagtct ctgctggcat 180
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 gaatgtttac tgcagcttct tctgtggtt cctgcccccc ttcaccagcc tgcgaggcct 360
 ctggtacacg actttctact gcctgttcca ggccctggcc acggtaagca gggccccttc 420
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<210> 33
 <211> 1275
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <222> (1)...(1275)
 <223> n = a,t,c or g

<400> 33
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 aatcaagaca gatggagagc tgaaatctag catcctgaat ggcagagcac attgactgca 180
 aaaaaaatac ttaaaacaat tcaacaaagc agacaaaaaa aacctgctta aatatatgat 240
 taagaagaac atattgatgc caaaaaccaa caagataatc tcagtggatg acctcctttt 300
 gaggtacaa ggctagtcca tatcaaagca ttcattcatc ctgtagaccg atagggtatgg 360
 aggggaagta ttattggaga gacctcaggg ttttctcacc tgagaaggga gagagccctg 420
 ggggtggtcag agctgggccc tgagtgggtg gatttagaaa gaagggaaga ggggagggct 480
 tggaagatag gaaaaacagc atgaacagca gcacggggaa tgggtgagtg tcctcctgaa 540
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 aaccttagag atagatgttc tgtatcatta tgtgcacctt acagttgggt cagctgaggc 840
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aaatcccagg	tcgattacat	cagagtcctc	tggggtgctg	ggacacaggc	atcagttttt	1080
gaggcttccc	aggtgatccc	tgcccaggnn	nnnnnnnnnn	ntnnnnnnnn	nnnnnnnnnn	1140
ncntnnnnng	nnnttgngt	ggtggngtac	gaggcgtgag	ttgatgggtg	ggtgggtggg	1200
tttgcgtgtg	gtacgattag	ggaaggttcg	gcaactggct	gcgatccctc	gccatttcgc	1260
cgatacgacg	tgccg					1275

<210> 34
 <211> 862
 <212> DNA
 <213> Homo sapiens

<400> 34						
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ccacagtcca	gctgccagcc	tcgccagaat	ccccttatta	tttgaaattt	attgttgtat	120
tcactcaatg	tattctgtgc	ctgaaatgca	tctctggagt	caacatgggt	accctttcct	180
tctttaaaag	ccttccctga	tgtgcagtgt	tacctgtggt	gtcctcttcg	ctctctcagg	240
cctcctgtta	tactcttctc	cttcccaca	ctggaacaga	cccagtagaa	ttgcagtgtg	300
tctcatgcgc	ctcactaagt	actgcactgg	gagctctgcc	gcctcctgcc	agtgactctg	360
cttcagccat	gttttcatgc	acagtgactt	gtcacatttc	tcacacatgg	cagacattta	420
taatgtctga	tgtgtgttga	gtgtctcaaa	agaaaaagg	acacaggtag	accttcagca	480
aggttgatat	ctagttagtt	gacagttttt	tgtaaagtat	tgcttcagcg	agctctacat	540
aaggggatac	agtattttct	tcatttatta	ttttctctcc	ttcagggcac	tgacaacctt	600
aaatagggtca	ctttaaaaaa	aatagctatt	tcctatttac	ataataaata	catgtgaaga	660
tttaagtttt	gtaagttgag	gttgaaaagc	tgattttaatc	actgtggcag	gagttgcaga	720
taataattag	gtgaaagaat	aggaagggtc	tcattgataa	cccattaaaa	tgagtattta	780
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<210> 35
 <211> 761
 <212> DNA
 <213> Homo sapiens

<400> 35						
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tggtgtctac	gaccgtgctt	acttcagcca	atttctctgc	tgaataacct	cctttttactg	240
atgaggaaac	caagtcaaga	agtcataaat	gacacaccca	aggctgggaa	gtgggtgagc	300
aggtatttag	actcaggtct	attttactcc	tgtgcctgtg	ggcgttttcc	acattctttt	360
cagttggaca	gttttaaaaa	tgtgtaatgt	tgcactcaaa	ttaaataaacc	tgaaattttg	420
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<210> 36
 <211> 614
 <212> DNA
 <213> Homo sapiens

<220>

<221> misc_feature
 <222> (1)...(614)
 <223> n = a,t,c or g

<400> 36
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 gtggagttgg catgtccagt tgcaggtatc agcaccactg caccatctcc tctgccttca 180
 cttcccacca gcacacagaa tttatatgcc ctccccaaagt ccaaaaaggg cccctgccnn 240
 nnnnnnnnnn nnnnnnnnnn ngcaaggcat gagctctgtc tcatggaagg gagaggccaa 300
 gttctctttc caccatcaga gtagtcgtt caacatcatt tatacaagac aggcttttgc 360
 ccttttagtc ttgctgaact agaattgagg atttgtgtag tcgaaagtca agctgatcat 420
 tgtcaagttt cgtggaagt gaacctgaag gaagggttagg tggagactgc agagagggtt 480
 agcgtcctgc cttaccacaa ggtaagtcta gaagagggtg ggggaaggag ttcagaattc 540
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 agtcaagagc tggc 614

<210> 37
 <211> 387
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <222> (1)...(387)
 <223> n = a,t,c or g

<400> 37
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 ctgcctctctg tgttctttgt gctgttatcc tcatatactt tcacagaaac cacacaattgg 180
 actgtttgtga ttttggcttt aaacagtaag ttatctccta aagacattga cccaatctgt 240
 tagtctttta gtcttttata cttccctcta ccatttctga tgtgcttcat tcctttgtgt 300
 ggacctgagt ttccaccggg catcatcttt ctccctgtgtg aataacttcc ttttagcagtt 360
 gttatagaac agatgtcgac gcggccg 387

<210> 38
 <211> 850
 <212> DNA
 <213> Homo sapiens

<400> 38
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 aaacaaacag tatctaagct ttattgagca atgtttatgc caggaaactgt gctaaggatt 120
 ttactagcat taccttattt aatccttaca aagcaggtag aattttttct attttctgat 180
 gaaattatgg catggaaagt ggtggcaccg gggcttgaac tcagtgtgtg gactccagac 240
 tccacactct ttaaccatta cactatacta tcctgacatt aatattctat atgattaagc 300
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 ctagtacta cacaatctta cagtgtcaga gctgataccta gtcctccttg attgtctttg 480
 gtgctgaact tactgatcct tagccctaag tcagtgtage agagtgggtt aggacagggg 540
 tcctggggca agaccagggt ttgaatcttt atcttagtca aaatatctga cttctatgcc 600
 tcagtttttt cattatactt ctcgaaaaat gcatagccct tcactctctc taaaaataac 660
 atccctttgc atttttattt ttgtctcttt ctgagactgt tactatctga atgcctgtc 720
 ttctagcctc catatctttt agcttttctt ttgcattcct atttctttat tctttcttac 780
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 ccgctgtatt 850

<210> 39
 <211> 612
 <212> DNA
 <213> Homo sapiens

<400> 39
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 tgccatgata ccttgcaaat taatctctat agcacaggac agcttcttaa aaaggctcat 180
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 gttttccaga ggaatgaaat gtaatattta agaatgaact tgacttgcac gaattaaaat 480
 gttttcaaaa ttttgtgtgc taagatgacg gcagccaaaa cagctatgtt tgggttatct 540
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 ttgttgactg ac 612

<210> 40
 <211> 600
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <222> (1)...(600)
 <223> n = a,t,c or g

<400> 40
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 ctggcattac tgccctcatcc tgtgggtttg ctcatctgact ctggagaact agaggccttt 180
 gagcagatat gcagaagcac cttgaaggca gtgtggcact cagtacatgg tgccatgtct 240
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 gcatagtgtt gttctaaaaat cttcttactt aagggtgattt ttacaacctc tttgctttcc 360
 ttcattgccc agcaagtctt tactcttctg aaatatctta ttgcagtcta gcccaaatgt 420
 tgtactttta tttattcttg tttcttttaa catgccatag aagagtttaa agctgtctgt 480
 taggagatag aattgatnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 540
 nnnnnnnnnn caacgatctt ctgacgttaa aaccatgaga cccaccttat caacctgacg 600

<210> 41
 <211> 348
 <212> DNA
 <213> Homo sapiens

<400> 41
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 aatgtgcacg tggagtgcgg gcccagcccc tgctaccgtt tgcgctgtaa tgggtggctgg 120
 tccaaagagt cctcagtttc ctccccgttg gggttgtgtg tacaacctta tcggttgtca 180
 ttttttgag ccatttttcag gttatttttc tggatttagc tggagggaca tttcctttag 240
 cctgtacttt atgggtcagg agtttcaaaa ccagtccttt ttgaagttag agtatcccta 300
 ataaaaaggt gagtgtcccc cctcctgtgc cctgggtttt ttgggttg 348

<210> 42
 <211> 379
 <212> DNA
 <213> Homo sapiens

<400> 42
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 aatactgggt tattttttaga atacagaaaa tgactaagaa gatgtactgt tcccacacag 120
 tgttcaccct catgggatct gatctcaact tggcttccct gtgagaagaa aaacatggca 180
 gcaaaaacaa gtatgatctt gtataccagc aatgggcaca tcaagaaatt atatagggcc 240
 taagcaggta cctgaactga ggtttgctcc acaatgcagt cacagtaagg gagaatgagg 300
 gctcatcagt ctatcacctt cccataagga aatgtaccct tctctaattc taaagagcct 360
 gtggcccata cagattcaa 379

<210> 43
 <211> 1245
 <212> DNA
 <213> Homo sapiens

<400> 43
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 ccattagatt tgctgtctgg acgtgtcagt agtaacaatc tcaatgtcac acggttattg 180
 aagagatcca tcatagagct tacattctag taaggagaga caggcagtat acaaatacta 240
 taaatacact ggaggaaaac atagtggggc tgattatagt cgatttttgc tcttttattt 300
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 gtgcaaaggc actgaggaaa gggcatcatg ggagggggca gcatgaaggc ctttgtttcc 480
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 gttttctttg tagctcctag tacaggctct acagacattt catat 1245

<210> 44
 <211> 624
 <212> DNA
 <213> Homo sapiens

<400> 44
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 tagttccaca tgggtcacgtg gctgtgggtg aaagcactct catatacaga gttgaagaga 180
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 ccgaagcttt caaattcaaa gtagactgtg ctaaatctct tatgatagtc accagcattc 360
 agagaaagaa aaaaccactt ccaactgaac ttacctagat atttggtagg gaacggcagg 420
 ggccgcagtgt gagggggggg ttgcagaatg ggaactcaaa acagaaaggg cagcagaagt 480

cctcactaga	aacaggcaac	agccactagt	ccactatgtc	taaatccctg	cccacatcgg	540
agaaaaagct	taactcatca	ataaaaacag	aaagagaaac	tgtcatgaag	caacactcat	600
tttgggattt	tataggacaa	cgaa				624

<210> 45
 <211> 801
 <212> DNA
 <213> Homo sapiens

<400> 45						
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tattcttagg	atttcctgtc	ctctgctgac	attgcccatc	tcttcttaca	tgctggctac	120
tttatccatt	ggaactctta	gcatgcta	catagtgtgt	tccgattcct	ggccttacag	180
ttccaacagt	cctgctatgt	ttgggtctga	tgctggcttt	atcccttcaa	attgtatttt	240
tgcccttttag	tatggcttgt	aatttttctt	aataactgga	catgaagtac	ttattaaaag	300
taatggcata	aataggtcct	taggaattta	ctggtaaagt	gtaggaggag	aggcagtgtt	360
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tcacaaggga	ttatcagcac	ctcctattcc	caactgaggt	ggcacaggct	agtagattag	480
gctggagtta	tgtattttcc	ttccccaatg	cggaaggctg	gaattgggca	tttctgtttg	540
tctaggtcag	ttaggtctta	ataaaacctc	agtgggtagg	ctgtgggtgaa	atagcttttc	600
ttaagggcag	atcttggtta	gaaagttaga	gtactctggg	ataccctaaa	tggtatcttt	660
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gcttgagctc	tgaagttaaa	atcaaatac	aaaaacaccc	tctgcaccat	acccccaccg	780
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<210> 46
 <211> 1027
 <212> DNA
 <213> Homo sapiens

<400> 46						
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<210> 47
 <211> 738
 <212> DNA
 <213> Homo sapiens

<400> 47
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 aacattctcc atccagttca aacctgatt cttgttagcc ttttgatctt gatagtagag 180
 cccctgtttg cctctctgac tccctctgagt ctctgttttg agtgtgttgt atttctaaat 240
 gtaggccaac atcttactga ccaaactttc tctttaaatg ggctgttgtt ttttaagcaat 300
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 tggcaatggt attcattgtg tatttctagt gtagagcaag tgatcagtat taaatgttga 660
 atgaatgaat acgttacaga aaacaggcca tggtcattc ccatttactg tactgagtca 720
 gaagatatac aagccagg 738

<210> 48
 <211> 467
 <212> DNA
 <213> Homo sapiens

<400> 48
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 tatagaacat ggggttaaaaa ctattctgat caaaccacca gcaagaatct tgaagaggaa 180
 gacagagggg gaagaaagca ataggcttac tctccctaca acttaattcc atgctctaatt 240
 tcagagcagt ataattaacc ccgagtttca ctgttaacac tgaagtttt cagcctgatg 300
 agaatatcat ttagtatcct gcaatcgcca ataatagcaa tatgacacaa tgggtgccc 360
 tgaggtctta atcagagcac atagtcattt acatagaaca ttttctgtga ctctctgtaa 420
 tacaacgcca caaagactca attgagacac aagtctcccc ttcccat 467

<210> 49
 <211> 687
 <212> DNA
 <213> Homo sapiens

<400> 49
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 cccatgaccc acctgtccca gctgtgtgtg tcagtgcgtc tgcctctctg ccagatgttg 180
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 atgccccacc tgagtccct tggcatttct tttctgtttc aggacacatg ggcctgtgt 300
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 ctttatgate cttcttcct tccctgactc acttccctct cctcctacc catattcaat 600
 gctttcctgg gggcacgatc tcaaataaga ttggatcctt ggctcaagggt ttgcttctta 660
 ggaacccaa accgacgtgt attgcgg 687

<210> 50
 <211> 457
 <212> DNA
 <213> Homo sapiens

<400> 50

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agaagattct	ggcagagcac	tgacactgaa	tccaactttc	acgcatcctc	tctccacatc	420
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<210> 51

<211> 1422

<212> DNA

<213> Homo sapiens

<400> 51

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tcattttcca	ggctgatgtc	tgggaattccc	cttagtaata	tttctgccat	tttttatgaa	180
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cagcttcttg	ttctcgtggc	gggagcggac	acagagcgta	ccgacactat	ctttttctaa	1380
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<210> 52

<211> 447

<212> DNA

<213> Homo sapiens

<400> 52

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tctatttaga	atcaagtcgc	tcatgagttt	aagaattaga	gcagcaagaa	attgggctag	180
agatgtacaa	aagctttgga	caatagtagt	tttgcttgct	ctcattctta	ttagaagtgc	240
tgtaatttta	ctgataaatt	ctaggacgga	agacaaatct	ttgcaactgg	tactatatca	300
gtcggtaatt	atgtgttttc	cttagaccat	attgagctcc	ccaagtacaa	gaacaatgag	360
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<210> 53

<211> 367
 <212> DNA
 <213> Homo sapiens

<400> 53
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 gatggcttca ttccgtagct ttgttccttc cctctgtttg ggatcctctt gacaagcaca 300
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 gcggccg

<210> 54
 <211> 917
 <212> DNA
 <213> Homo sapiens

<400> 54
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 caacacctca ttcttagaga atgaggggtt caatgagctg agcagaggaa gttggtttta 120
 tagacagggg ctgaggaaaag cagaaacaga aaacaaaaaa tgggtgggtt caaagttaat 180
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 ggggcttggc tattatctct tctaatttct cagaagtcag atgaacaact ttgctttggc 300
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 cctttaaatt catcccatgt tcccagacc ctttaaagtc tatccatgga ccgcaggcta 540
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 aaaccacttg agacaattgg gaaaatatta atgctgaaac gtaatagatg ttaaggaatt 780
 attgagttct ttcccttag gagtgggtgg taaaataaaa cgtcctagaa atgtatgaag 840
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 gagtagagat gaaataa 917

<210> 55
 <211> 688
 <212> DNA
 <213> Homo sapiens

<400> 55
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 aaccactct tagtatgttt tcttgcatca ctacattcag taatgaatat aacatactaa 120
 gagtgggttt gaaaatgtca tggaaacttc ctctgctttt acaaaccac tcttagtatg 180
 ttttcttgca ttactacatt cagtactgaa cataacatat actcctccaa aaaagaaaaa 240
 cgaaaattgc tccaaacccc tgatcctgac cagttcccta gggactgtac aataacgtta 300
 caagcagcat taacactacc accggcaatt aaaaaacaaa ttaaccatata ataacgacct 360
 cagaccatgc tgcagtaatg acagtggcct agcagagcga gcgagcaggc tgagggatgc 420
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 agggagaaaa gaaaattaaa acaaagaaat taaaccgat tccttaattct taaagtgcga 540
 tgtatcagtc acattcatgc ctgcctgggg agagagctga actaaaaaca ctcaacgggc 600
 aaatgatccc actactgtct ggcacgtgaa cgacgggctc ttacatgcca cgttccacct 660
 catcaaggca agattgtcga cgcggccg 688

<210> 56
 <211> 1003
 <212> DNA
 <213> Homo sapiens

<400> 56
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 gtccactgag ggaccttctt caggacatgc cccagggtcag ttgttggtatt aggcaggcct 180
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 cgccagatat tcttcagtga gtatgcttcc tgagtgaat ataaagggtga aggaacattg 360
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 ggaacctttt atggaaccag ctttcattaa attctgggtta aaaatatttc accttttccg 960
 gttaaaaaca aaaaaaacc caaaactcat tgtattgcgc ccg 1003

<210> 57
 <211> 401
 <212> DNA
 <213> Homo sapiens

<400> 57
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<210> 58
 <211> 206
 <212> DNA
 <213> Homo sapiens

<400> 58
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 ggaaaagagct gttaggggag cacaggagaa gtaataaagc cctgcacatg gtggccctcaa 180
 tgaatataga gaggaggga cagatg 206

<210> 59
 <211> 649
 <212> DNA
 <213> Homo sapiens

<400> 59
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<210> 60
<211> 408
<212> DNA
<213> Homo sapiens

<400> 60
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<210> 61
<211> 756
<212> DNA
<213> Homo sapiens

<400> 61
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gaaacaagat tttaaataaa agaaaatatt aataag 756

<210> 62
<211> 675
<212> DNA
<213> Homo sapiens

<400> 62
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<210> 63
 <211> 921
 <212> DNA
 <213> Homo sapiens

<400> 63						
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gtccttgtct	cttgagccag	tatctgcaat	tttaacgggtc	ccccagagg	attccaaagt	720
actgtaaagt	ttagaaagca	ccgctattta	cagtaatgca	gacttgca	attctgagcc	780
tgcatagtat	atcattctta	aaatgatact	gtctttatto	tgttaaaatt	gtaaaagttc	840
actattaggg	cttgattttg	tttttcta	tattgcaaaa	tatttcaa	agaaaagtat	900
cagggttat	ttccattgtc	a				921

<210> 64
 <211> 507
 <212> DNA
 <213> Homo sapiens

<400> 64						
aattcctggg	tcgacgattt	cgcccgactt	ggcctgaagg	aagtgacatg	agcataagga	60
agtgggggtgc	gggtgggagcg	ggtcaagtga	cagaggaggg	ctgggaaata	ttaatgaata	120
gagtctgttg	agatccaagc	caatgtgact	taaagcacca	ggcaaccaga	atcgtgatgg	180
gtcagtattt	ccccaggcc	tatccagacc	aggctttatc	ctcctagcaa	cgcggccctc	240
tcggctctta	aggcgtgact	tgccatggat	gttctgcctt	tggaaccagt	gggtgggtcac	300
agcacagagg	ctgttggttt	catggctgtc	acatgcacag	agacagccct	gtccactgag	360
cctgttctgt	ggcagaagga	acccoctagc	ctggaccatc	tttgggtgga	aacaccagcc	420
cctcacgtct	gactgtcatt	ttcagatgtg	aagagaacac	acagtgttgc	cgatgtgttt	480
gtattgctg	taaacaacga	ttgtatt				507

<210> 65
 <211> 391
 <212> DNA
 <213> Homo sapiens

<400> 65
 ggcacgagga tcttttgttg cccttccttt ttaagccttt cctgtgcata gtgaagaatg 60
 cgcatgacta ctagtagttt ggtgttacgg cctttatttg tgctaaagtg ccagcgtttt 120
 taccacccat tgtatctgca cccttacagc atatgtcaac atgttagtat tcttgtaaaa 180
 aatagtttgg gacctggggg ttctaaggtc ccacttttg ggaaccattg aaataggtac 240
 ttagatctac agtgtatcat atcttttcat tctacaagat taaaaacatg atttcagtta 300
 attgtttttg taaatttctt aatatggtgt tgagggggtt cagtccagag tgaagacatg 360
 tatgtttctt ggcttatgct gaagtttact t 391

<210> 66
 <211> 390
 <212> DNA
 <213> Homo sapiens

<400> 66
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 ccaggatgt gcaggaagga ggctgagtgg ggagggccag gaagccgaag gcctgagcag 120
 gaatccggga catcaactct tatgctcgca aggaggcatt tgtgcccatg gggctctggg 180
 ctccctacaa ccgcagcacg atctggggag agaacggaga gaaggagag ggtgcgcaca 240
 gccagcccc gtaaaatcct cttcaaaacg cagccaccca ggggttctag cacagacaga 300
 tgcccatggg gcaggcagtg caagcatggg acaggcacct gccatatgcc caacagataa 360
 caggacaact gtttaccat ccttggtatt 390

<210> 67
 <211> 804
 <212> DNA
 <213> Homo sapiens

<400> 67
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 actaagttct cagtaaaaat gatgtttagt aaggaaatga tgtcagtcag cctgcagctc 180
 atattgataa gccatccaaa attggtccca taggtgatga catctagacc tcaacttctc 240
 cgctacctgt gctctcttcc ccctcttctc tttcctctgt tgtcaciaag ccagctactg 300
 ccaggatccc ccctccccat cgctctgcag tccagggtgg ggtctctgtt agcatgagga 360
 aacgtgaaag gaaatgtatc tctgtgtacc tttattttcc ctccagggtc taaatggaaa 420
 aagagagaag gtggagtccc ttttgccatt gtaactggaa ttaaaaaact taaaaaactc 480
 aagttggagc tctgagtgc ttttcccaca aaaaccatgt tatatatagt ggtttggttc 540
 tatggtacta ttaataagac agaatacttc agctatgatt tctgggctgg cctgggaaac 600
 cactaaatat gacatagttt cagtgaaaaa gtgcgttcag gggtcccagc aatgagtttt 660
 acaaaccac aatcagaaca caaccatct gaaagctgag ggccgcctac ttcgcagtag 720
 gtttgacagc ctcaaaaagg catccgaatg tcatagacgt caacgccaag cttaagagtc 780
 tctgcgtgg cgctccagca gtac 804

<210> 68
 <211> 386
 <212> DNA
 <213> Homo sapiens

<400> 68
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 agtccttggg aaatctcatc cacacacttg gatttttggc gataattcac aaatatatgt 180
 cagctttcaa aaaccgcaca gatgagttta tgaatatggg tatgcagccg tatataaaat 240
 ctcttaccg actatcaatg tctcagatca gcctgaaatt tgacttgtct caaactgate 300

ttatttttacc ccacaaattc tactctcctt cctccttccc tactgtcatg ttattctatt 360
cattcggtag gttaagccat aagcct 386

<210> 69
<211> 282
<212> DNA
<213> Homo sapiens

<400> 69
cgacgataaa acaggggaag gaggggaacag gtagggctgg ctgcaggaaa gcttgcaggt 60
atggggtaca cagttaaaag ggagtgtctt ctgatatgtt tgatgcaggc ctggaggctg 120
tttgttatgg ggggtggaggt cctgatgtac atttgtggcg taagatgccg tgctgatttt 180
gccaccagcc tgtggcagcc ctggtgttac accagggcag gtgggcagtt taatgtatct 240
caggccagat gacctgcctt gcccacctgg tcgacgcggc cg 282

<210> 70
<211> 338
<212> DNA
<213> Homo sapiens

<400> 70
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tctctcctcc agtctttact tagtcttaat tctgttagta accgtatatt taatgctcac 120
cactagttct tataatgatg tttctttagt catttggatt gcctcaagtt ttgcctctag 180
taaattcttt aggaaaggct taagggaata ttcataattc atgaattttc ttgctcgttc 240
ataacatttt gtctgtgttt tttatatcta aagtttgtgt ttgccagaaa tagaatcctt 300
ggctcacttt ttcttttctt gaatatctta aatttgaa 338

<210> 71
<211> 380
<212> DNA
<213> Homo sapiens

<400> 71
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accaagacaa atgctggagt ggctctcctt tggacaaatc cttcccatga tcatccact 120
acctcctctc cctgccttag tggtttggcc cattgggctc actcactgcc cttggccctc 180
cccttttgtt ccagcctctc tggatgggtt ctacaacagt cgcagcctgg atggttaagtc 240
tccacccttg aggccagaga agtggctctc ctggctctgg ttctcacggc tcccaggtea 300
tgggcttccc aaggaggag ggcagagaaa gagagaggtt tgggcctagc aggttaaaaa 360
gtccttctgt cgacgcggcg 380

<210> 72
<211> 391
<212> DNA
<213> Homo sapiens

<400> 72
ctttgaaagg gccacatgct ctgccatgct agctgaactg cataagaatg catcagttat 60
gcaaagcatc ttttaccaca attgcacaaa tactactttt tatttaaacc cttggctcat 120
gattaatgta ttcactaac aaagtcccaa aataatggaa ggatgatgct gtggcaggtt 180
tacctggac catctgcgca ggagctctgc ctctttctcc atgcaccctg gtccatgtcc 240

acagcagtgg	agagagataa	gagacagaag	gatggacgta	gtcaccgcat	gttgctgccg	300
cagccccaga	gcctgatgtc	tagatgttgc	taggtagacg	tccagagttt	agcaggatag	360
attcttgata	ttctgctaga	atcaacaatt	t			391

<210> 73
 <211> 363
 <212> DNA
 <213> Homo sapiens

<400> 73						
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tgtatttttt	tttcttactg	cgtaatatgt	agggtctaaa	gttttgaaact	cttcacttca	180
gaaattactt	ttccagacaa	aagagcaaaa	caatgtttgt	ttaaattgtt	ctctggaaca	240
tgactgatag	tgtttacaac	atcttatga	cattttgatc	ctgtggggag	tacttggaaga	300
ggtattttaa	gtgcttttca	ctaaatcaga	tgctttgtag	tgtttgaacc	ttttttaaaa	360
aaa						363

<210> 74
 <211> 1120
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <222> (1)...(1120)
 <223> n = a,t,c or g

<400> 74						
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tctttctggg	tttgtgtgat	aaaccttttt	atggctacac	agattttctt	actgatgtag	180
caaagattgt	aactgttctc	attttgaaag	caaagatgcc	catacaacat	gggaaatact	240
gatnnnnnnn	nnnnnnnnnn	nnnnnnnnnc	ttcagttatg	agttgggtgc	tggtaaaact	300
aaagcccagt	ttgggggtcc	ctttgcagaa	ttttctgnnn	nnnnnnnnnn	nnnnnnnnnt	360
actgcttgtc	gttttctgta	tatttaactg	gagctgggga	ataattggtg	tttggcaatc	420
tctgtatcat	tcattgttag	caaagctgct	actgtcaccc	acagatacat	ttgtttgcac	480
tccattgcaa	ggattgaagt	cagcacattc	ttagtcccaa	attgcttttg	gatattaatg	540
tttatcactt	ctataaccat	aaggagaatc	aaaaggctat	tggaataaagt	caaagcttgt	600
tatgcgcctt	acatatgtgg	tccgagaacc	cattaaaaat	cccagaggtc	aaaataccct	660
ccagaagtgt	cactatcatt	tcttccttct	ttcttccccc	ggcaacgcta	tttcatttgt	720
ccccctccgc	gtcctgccgc	agttcacaaa	cactccttcc	ctgcgcctcc	agcgccgcca	780
tgcacccata	ctctccatcc	cttctcgtgc	cgggtcgtgg	caacacacat	ctcgcgtnnn	840
nnnnnnngcg	ttccgtcccc	ccccacacac	tccccctctc	ccctcactcc	cggatatccag	900
ccctccccac	actacaccgc	tgggggcccg	cgccccgcgc	ccccctctc	cccgtctcgg	960
ccgcggcccc	acctggacac	cacacaccc	ctcgccccgc	ccccctctcc	tcacttttgcg	1020
caaaacccca	catacccccg	ctccctcgcc	cccggatcac	agcccgatca	ccaactcacc	1080
ccgcgcgcgc	ctccgcgtcg	ccccgcgcgc	cacaccgccc			1120

<210> 75
 <211> 353
 <212> DNA
 <213> Homo sapiens

<400> 75

cgcgccgcgcg	tcgacctagg	cagagaaacc	atgagctgga	taatctttcc	ttgtctttga	60
agtctctgtt	actgagaact	ggtgagaaca	ggtgagcaaa	gacaaatgaa	tctctgccta	120
agagcctatt	gctgttgagg	actacatgtc	catattgggt	gtttctgcct	ttctggctaa	180
tttgaggctg	ttgatgacca	tctcgacttc	ccagatgtta	aatatgacaa	aaataaccta	240
tcttgctcct	tttcttcacc	tttcagctct	cagaattggc	agtacacccc	acagcttctt	300
gctaaagtcc	tatcacctgg	ggacccactt	ttcattatct	cacatgaact	cac	353

<210> 76
 <211> 341
 <212> DNA
 <213> Homo sapiens

<400> 76						
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tccaatgttt	gtatttgtct	ccatccatac	cgagcttggt	cccatTTTTaa	gacctttgtg	120
cttgctgtac	tgctgtccag	attgctctgt	acccagacct	ttgtatagcc	tcaaatatct	180
cctgcttgag	aaatgacttt	cctgaactcc	aaattcacat	gtcctccttt	acccagtcac	240
tccattatat	cattctgtct	tatttctttc	atagcatttg	tcacatcttg	cttgtattgt	300
gaaattaatt	tacttgctta	atgtctataa	ccatctctaa	g		341

<210> 77
 <211> 441
 <212> DNA
 <213> Homo sapiens

<400> 77						
ggaattcccg	ggctcgacgat	ttcgtctttt	tcttatcata	ccacagcatc	ttggatttac	60
agcaaaatgt	taaatagaca	tgatgagagt	gatcatccta	atctggtttc	gaatctcaaa	120
gggaacatth	cagcattcca	ccactaagtg	tgatgtttgc	tttagagttt	ttctttttatc	180
aaactgttca	tttctaagtc	ttaattataa	attgacttca	gatttcacat	tctattgagg	240
cactatgtga	tatttttcct	ttacttttaa	aatcctttaa	gacattatta	ctttactttt	300
taatgtggca	attatagtag	attagttttc	tgaatgggtc	gccaaccttg	caattactgg	360
aataaaacca	atthttatcat	gttggattat	ttttatatat	cgatggaggg	ggtttgctaa	420
tattttctta	ggaattttgg	c				441

<210> 78
 <211> 342
 <212> DNA
 <213> Homo sapiens

<400> 78						
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aacactaaat	ttacaaattg	cacatttatg	caaattggtg	taccaaggct	tctctctgta	120
ccccaattgc	tcaacacagc	tccactgttc	ttaccatggg	agaaaaccgt	aaaaactcag	180
tattctggaa	taatctttta	attcaaaagt	agaatagaaa	cagcagagaa	aagtataggg	240
gataccaaag	agagaattca	gccaaagtca	atatagaata	cactgtcttc	ctgtttttcc	300
tacctaacc	acattattgc	cctattctta	gtcccccaa	aa		342

<210> 79
 <211> 390
 <212> DNA
 <213> Homo sapiens

<400> 79

atggggaatg	tgatgttctc	ttgggtatta	tgctaatacat	atdddggcag	gtttccctgg	60
agcagatgca	gaaatgatca	taccactttc	caggggtgtat	tatdddtagct	ccttagactt	120
tgtccatgct	ctgtccctccc	ctccccactg	taaataactct	tctdddgggc	tagggggctg	180
tgccctccag	gggtattgttt	tccttctctgt	tcagtgccca	tgctcttgcc	tgtgtttctc	240
ctgtaccttt	cccaggacct	agcagacagc	cgagcacctg	cccactgctc	tgtaaataact	300
gacctgcatc	tcaagtgggg	tagcctttgt	gtcctttccc	atdddccaagt	tgatttgccct	360
gtgaatccca	tatgtgtaca	catatgcaga				390

<210> 80

<211> 323

<212> DNA

<213> Homo sapiens

<400> 80

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agaacatgto	attdgatctc	tcttaacatt	ttatagagto	ctcctctata	aagagataat	120
tggactgcat	cattgttttc	aacattttca	tgtaaatgca	tttttactat	cacctctccc	180
cccatcatga	ctattgccct	acttdgagta	gacatagatt	gagaatatgt	tttggctaaa	240
accatcacat	tcatcagtta	cgagccactg	gttactattd	cttaaaggaa	attdtgagaa	300
aattgtgaat	gacagcactt	ctc				323

<210> 81

<211> 383

<212> DNA

<213> Homo sapiens

<400> 81

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gcacacctct	gggtgcacat	acctgggtata	cacatgtgca	agggcatggg	tacacttgct	120
cgtgtggata	tgatcacagc	tgagtacatg	ggcttgtgag	tgacacaagaa	tagaaaagga	180
tgtgcatgtt	tgtgcatgca	cgaggacaca	cagagcacac	gagcaccac	aggacacata	240
gacaagccaa	agggcactca	tgtgtggggg	tcaaacatct	gagagcgcgt	gaccagtgtg	300
agtctgaaca	ccatacactc	tattgacagg	tgtctgatat	ggccatggto	tgactataa	360
ccactaagag	gatcactggc	tcg				383

<210> 82

<211> 214

<212> DNA

<213> Homo sapiens

<400> 82

ttaaaagtga	tgaagaagaa	agaaagaggt	tatgtcctag	aaacacagat	acttcttggg	60
tttcaaatac	ttgctgtgaa	caaattgact	tctctgggtga	atgcatacgc	cttccctgac	120
ttcaatcaaa	gaatagaatt	tcatacactt	aaagggtttg	gggaaaaaaa	acaacaaaca	180
aaaccaaaat	ctctgggaaa	tgggaaaaaa	gaag			214

<210> 83

<211> 94

<212> DNA

<213> Homo sapiens

<400> 83
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 aattctaata tgcataataa tgcagttctc tcct 94

<210> 84
 <211> 358
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <222> (1)...(358)
 <223> n = a,t,c or g

<400> 84
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 aaatctctaa ccagtcctcc atgcccaacc gcatagaact ctctgctctg ttcagggtac 120
 catttcatgt tgattggctt nnnnnnnnnn nnnnnnnnnn nnnnnngtgt tatgtccttg 180
 gggtctgcct acctccaca gtcaaaacac attcggtgat tgtgggtgct gtttttcaaa 240
 gtgagattgt cactaatgtt tgccagattt ataaatgtaa aacaacttga cagattttgt 300
 atgagttttt tgggtgcaga tgacttaagt tctggaatta ttaacatgtg actgagag 358

<210> 85
 <211> 1092
 <212> DNA
 <213> Homo sapiens

<400> 85
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 tcaagatatg aagttaaaat taggtactgg gattgtcac ctgagttttg gtccttgaga 180
 tgatgctttt ctgtgtgcag atagttgcta aaatttggtg ttctgtctgg gggtacaaac 240
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 aatacataga atagtgcag ctgcagagtt agttttagtt gcctttccag gtaggaccat 480
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 gcggtccctt gactgaagaa ccattccctcg caccttctac tcagggcgcg cggcgtaacta 1020
 acactactcc cgagctcgcg gcccgctccg tcgctccgtg cttcatata tcttacacgt 1080
 tcacgcgcgg cc 1092

<210> 86
 <211> 415
 <212> DNA
 <213> Homo sapiens

<400> 86

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agtacattgc ccttgtctgt atacagtatt atacttttatt ttaaaagttt acaccaaata    60
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ggcctttcag acactctcct gtttccctcc tctgactcct gctgggtttac ttctgctat    180
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attatatgcc tttgctttac attatatgcc ttagacagct tgttctgttc cattccaaat    300
gccactctca acactcctgc agagcgggag gcatacagta ctcaatgcac gtgagtctct    360
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<210> 87
 <211> 451
 <212> DNA
 <213> Homo sapiens

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<400> 87
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tttgcttaat gggttggctg tggagggaga gggaggaatc aagggtgcct tcaggttgca    180
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caggtggaga ggagtgggta gcaagagttc tgtgtaaata cttgggaggc atccaagcgg    300
agagttaagt aggcactgaa tatttaagtt gagctgaggg gagtgatcta cactggacat    360
aaattttggg agtcactagt atacagatgg catgtcatgg aactgattga gattgtttgt    420
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<210> 88
 <211> 74
 <212> PRT
 <213> Homo sapiens

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<400> 88
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Thr Ala Arg Val Ser Pro Arg Glu Thr Arg Arg Arg Thr Ile Arg Met
             20             25             30
Arg Asn Lys Ser Leu Leu Leu Phe Ser Asp Thr Asn Met Lys Asn Glu
             35             40             45
Gly Glu Asp Ile Thr Thr Gly Asn Ile Met His Asn Ser Met His Ile
             50             55             60
Asn Ser Ala Thr Leu Met Lys Trp Thr Asn
65             70             74

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<210> 89
 <211> 92
 <212> PRT
 <213> Homo sapiens

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<400> 89
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 1             5             10             15
Phe Asp Cys Asn Arg Glu Asp Met Ala Arg Lys Met Trp Gln Asp His
             20             25             30
Leu Leu Gly Glu His Ser Arg Ile Pro Ser Val Leu Val Pro Gln His
             35             40             45
Gln Leu Thr Met Phe Leu Leu Met Met Thr Gly Arg Val Asp Thr Ser
             50             55             60
Leu His His Ile Leu Phe Ser Asp Lys Val Gln Ala Thr Val Phe Ser

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80

<400> 90

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<210> 91
<211> 73
<212> PRT
<213> Homo sapiens
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<400> 91

37

65

70

73

<210> 92
 <211> 484
 <212> PRT
 <213> Homo sapiens

<400> 92
 Met Ala Ser Ile Ser Glu Pro Val Thr Phe Arg Glu Phe Cys Pro Leu
 1 5 10 15
 Tyr Tyr Leu Leu Asn Ala Ile Pro Thr Lys Ile Gln Lys Gly Phe Arg
 20 25 30
 Ser Ile Val Val Tyr Leu Thr Ala Leu Asp Thr Asn Gly Asp Tyr Ile
 35 40 45
 Ala Val Gly Ser Ser Ile Gly Met Leu Tyr Leu Tyr Cys Arg His Leu
 50 55 60
 Asn Gln Met Arg Lys Tyr Asn Phe Glu Glu Phe Asn Ser Leu Lys Ser
 65 70 75 80
 Leu Lys Cys Phe Arg His Phe Ile Arg Lys Thr Arg Glu Ser Asn Asp
 85 90 95
 Glu Pro Gln Gln Asp Leu Ser Lys Lys Ser Met His Arg Gly Thr Leu
 100 105 110
 Val Thr Leu Leu Lys Ile Thr Ile Leu Lys Ser Val His Arg Gly Val
 115 120 125
 Leu Val Thr Leu Leu Asn Ile Thr Ile Leu Lys Ser Met His Arg Gly
 130 135 140
 Val Leu Val Thr Leu Leu Asn Ile Thr Ile Leu Lys Ser Met His Arg
 145 150 155 160
 Gly Val Leu Val Thr Leu Leu Lys Ile Ala Val Leu Lys Ser Met His
 165 170 175
 Arg Gly Val Leu Val Thr Leu Leu Lys Ile Thr Val Leu Lys Ser Met
 180 185 190
 His Arg Gly Ile Leu Val Thr Leu Leu Lys Ile Thr Ile Leu Lys Ser
 195 200 205
 Met His Arg Gly Val Leu Val Thr Leu Leu Lys Ile Thr Ile Leu Lys
 210 215 220
 Ser Met His Arg Gly Val Leu Val Thr Leu Leu Lys Ile Thr Ile Leu
 225 230 235 240
 Lys Ser Met His Arg Gly Thr Leu Val Thr Leu Leu Lys Ile Thr Val
 245 250 255
 Leu Lys Ser Met His Arg Gly Thr Leu Val Thr Leu Leu Lys Ile Thr
 260 265 270
 Ile Leu Lys Ser Met His Arg Gly Ile Leu Val Thr Leu Leu Lys Ile
 275 280 285
 Thr Ile Leu Lys Ser Met His Arg Gly Ile Leu Val Thr Leu Leu Lys
 290 295 300
 Ile Thr Ile Leu Lys Ser Met His Arg Gly Val Leu Val Thr Leu Leu
 305 310 315 320
 Lys Ile Thr Ile Leu Lys Ser Met His Arg Gly Val Leu Val Thr Leu
 325 330 335
 Leu Lys Ile Thr Val Leu Lys Ser Met His Arg Gly Val Leu Val Thr
 340 345 350
 Leu Leu Lys Ile Thr Ile Leu Lys Ser Met His Arg Gly Thr Leu Val
 355 360 365
 Thr Leu Leu Lys Ile Thr Ile Leu Lys Ser Met His Arg Gly Val Leu
 370 375 380
 Val Thr Leu Leu Lys Ile Thr Ile Leu Lys Ser Val His Arg Gly Val
 385 390 395 400
 Leu Val Thr Leu Leu Lys Ile Thr Val Leu Lys Ser Met His Arg Gly
 405 410 415
 Thr Leu Val Thr Leu Leu Lys Ile Thr Ile Leu Lys Ser Met His Arg

```
<210> 93
<211> 504
<212> PRT
<213> Homo sapiens
```

39

```

      355      360      365
Asn Phe Tyr His Phe Thr Arg Pro Leu Ile Lys Pro Gln Cys Ala Ala
  370      375      380
Tyr Gly Lys Ala Leu Asp Leu Ser Leu Asn Ser Ile Phe Phe Ile Gly
 385      390      395      400
Pro Asn Gln Phe Glu Asn Leu Pro Asp Ile Ala Cys Leu Asn Leu Ser
      405      410      415
Ala Asn Ser Asn Ala Gln Val Leu Ser Gly Thr Glu Phe Ser Ala Ile
      420      425      430
Pro His Val Lys Tyr Leu Asp Leu Thr Asn Asn Arg Leu Asp Phe Asp
      435      440      445
Asn Ala Ser Ala Leu Thr Glu Leu Ser Asp Leu Glu Val Leu Asp Leu
      450      455      460
Ser Tyr Asn Ser His Tyr Phe Arg Ile Ala Gly Arg Asn Thr Ser Ser
 465      470      475      480
Arg Ile Tyr Ser Lys Phe His Lys Ser Lys Ser Phe Lys Leu Glu Pro
      485      490      495
Gln Gln His Leu Tyr Phe Asn Arg
      500      504

```

<210> 94
 <211> 583
 <212> PRT
 <213> Homo sapiens

```

      <400> 94
Met Ala Asp Tyr Ile Ala Asn Cys Thr Val Lys Val Asp Gln Leu Gly
  1      5      10      15
Ser Asp Asp Ile His Asn Ala Leu Lys Gln Thr Pro Lys Val Leu Val
      20      25      30
Val Gln Ser Phe Asp Met Phe Lys Asp Lys Asp Leu Thr Gly Pro Met
      35      40      45
Asn Glu Asn His Gly Leu Asn Tyr Thr Pro Leu Leu Tyr Ser Arg Gly
 50      55      60
Asn Pro Gly Ile Met Ser Pro Leu Ala Lys Lys Lys Leu Leu Ser Gln
 65      70      75      80
Val Ser Gly Ala Ser Leu Ser Ser Ser Tyr Pro Tyr Gly Ser Pro Pro
      85      90      95
Pro Leu Ile Ser Lys Lys Lys Leu Ile Ala Arg Asp Asp Leu Cys Ser
      100      105      110
Ser Leu Ser Gln Thr His His Gly Gln Ser Thr Asp His Met Ala Val
      115      120      125
Ser Arg Pro Ser Val Ile Gln His Val Gln Ser Phe Arg Ser Lys Pro
 130      135      140
Ser Glu Glu Arg Lys Thr Ile Asn Asp Ile Phe Lys His Glu Lys Leu
 145      150      155      160
Ser Arg Ser Asp Pro His Arg Cys Ser Phe Ser Lys His His Leu Asn
      165      170      175
Pro Leu Ala Asp Ser Tyr Val Leu Lys Gln Glu Ile Gln Glu Gly Lys
      180      185      190
Asp Lys Leu Leu Glu Lys Arg Ala Leu Pro His Ser His Met Pro Ser
      195      200      205
Phe Leu Ala Asp Phe Tyr Ser Ser Pro His Leu His Ser Leu Tyr Arg
 210      215      220
His Thr Glu His His Leu His Asn Glu Gln Thr Ser Lys Tyr Pro Ser
 225      230      235      240
Arg Asp Met Tyr Arg Glu Ser Glu Asn Ser Ser Phe Pro Ser His Arg
      245      250      255
His Gln Glu Lys Leu His Val Asn Tyr Leu Thr Ser Leu His Leu Gln
      260      265      270
Asp Lys Lys Ser Ala Ala Ala Glu Ala Pro Thr Asp Asp Gln Pro Thr

```

```
<210> 95
<211> 163
<212> PRT
<213> Homo sapiens
```

41

```

      115      120      125
Pro Gln Gln Gly His Gly Thr Gln Ser Cys Gly Leu Gly Ala Cys Trp
      130      135      140
Ile Gln Pro Leu Pro Ser Ser Arg Cys Leu Pro Phe Gln Val Pro His
145      150      155      160
Ser Ser Asn
      163

```

```

<210> 96
<211> 49
<212> PRT
<213> Homo sapiens

```

```

<400> 96
Met Pro Leu Ser Asp Pro Val Asn Ile Ala Lys Val Ser Lys Tyr Lys
 1      5      10      15
Gln Glu Tyr Pro Ile Arg Asp Asn Glu Gln Arg Leu Cys Ile Gln Ser
      20      25      30
Glu Lys Gly Thr Asn Arg Asp Lys Leu Thr Phe His Val Arg Asn Leu
      35      40      45
Gly
49

```

```

<210> 97
<211> 111
<212> PRT
<213> Homo sapiens

```

```

<400> 97
Met Val Gln Lys Ala Pro Cys Trp Arg Val Ser Val Glu Leu Ala Leu
 1      5      10      15
Glu Leu Cys Gly Ser Pro Glu Phe Ser Met Phe Ala Asp Ala Ala Met
      20      25      30
Ala Ala Leu Ser Trp Ala Ala Pro Ser Ser Ala Ser Thr Cys Ser Val
      35      40      45
Pro Arg Ser Ser Ala Ala Gln Ala Pro Arg Ala Pro Ser Pro Ile Val
      50      55      60
Pro Arg Ala Gly Cys Gly Ser Leu Val Gly Ser Gln Pro Arg Trp Arg
      65      70      75      80
Arg Arg Glu Arg Leu Leu Cys Ala Ala Gly Ala Gly Ser Ala Ser Pro
      85      90      95
Ser Ala Ala His Val Ser Pro Pro Ala Ala Ser Cys Arg Ser Cys
      100      105      110 111

```

```

<210> 98
<211> 203
<212> PRT
<213> Homo sapiens

```

```

<400> 98
Met Glu Thr Trp Asp Ser Gly Leu Cys Phe Pro Gly Cys Leu Ser Leu
 1      5      10      15
Thr Gly Pro Gly Ser Val Thr Gly Thr Ala Gly Asp Ser Leu Thr Val
      20      25      30
Trp Cys Gln Tyr Glu Ser Met Tyr Lys Gly Tyr Asn Lys Tyr Trp Cys

```

```

      35      40      45
Arg Gly Gln Tyr Asp Thr Ser Cys Glu Ser Ile Val Glu Thr Lys Gly
  50      55      60
Glu Glu Lys Val Glu Arg Asn Gly Arg Val Ser Ile Arg Asp His Pro
  65      70      75      80
Glu Ala Leu Ala Phe Thr Val Thr Met Gln Asn Leu Asn Glu Asp Asp
      85      90      95
Ala Gly Ser Tyr Trp Cys Lys Ile Gln Thr Val Trp Val Leu Asp Ser
      100      105      110
Trp Ser Arg Asp Pro Ser Asp Leu Val Arg Val Tyr Val Ser Pro Ala
      115      120      125
Ile Thr Thr Pro Arg Arg Thr Thr His Pro Ala Thr Pro Pro Ile Phe
      130      135      140
Leu Val Val Asn Pro Gly Arg Asn Leu Ser Thr Gly Glu Val Leu Thr
      145      150      155      160
Gln Asn Ser Gly Phe Arg Leu Ser Ser Pro His Phe Leu Leu Val Val
      165      170      175
Leu Leu Lys Leu Pro Leu Leu Leu Ser Met Leu Gly Ala Val Phe Trp
      180      185      190
Val Asn Arg Pro Gln Trp Ala Pro Pro Gly Arg
      195      200      203

```

<210> 99
 <211> 65
 <212> PRT
 <213> Homo sapiens

```

      <400> 99
Met Arg His Cys Pro Thr Phe Val Gln Ile Ser Ala Thr Val Phe Phe
  1      5      10      15
Ser Phe Gly Pro Tyr Ile Lys Tyr Gly Ser Phe Gln Arg Lys Glu Thr
      20      25      30
Lys Val Ala Val Pro Pro His Ile Phe Arg Arg Arg Gln Arg Leu
      35      40      45
Gly Ser Thr Arg Leu Leu Phe Trp Trp Val Trp Trp Gly Cys Ile Ile
  50      55      60
Thr
  65

```

<210> 100
 <211> 174
 <212> PRT
 <213> Homo sapiens

```

      <400> 100
Met Ser Arg Tyr Ser Tyr Gln Ser Leu Leu Asp Trp Leu Tyr Gly Gly
  1      5      10      15
Val Asp Pro Ser Ser Ala Gly Asn Gly Gly Pro Asp Cys Ala Ala Phe
      20      25      30
Leu Ser Cys Gln His Arg Leu Leu Glu Ser Val Val Val Leu Thr Leu
      35      40      45
Ala Leu Leu Glu Ile Leu Val Ala Leu Arg His Ile Leu Arg Gln Thr
  50      55      60
Lys Glu Asp Gly Arg Gly Ser Pro Gly Ser Gln Pro Glu Gln Val Thr
  65      70      75      80
Gln Arg Pro Glu Glu Gly Lys Glu Ser Leu Ser Lys Asn Leu Leu Leu
      85      90      95
Val Ala Leu Cys Leu Thr Phe Gly Val Glu Val Gly Phe Lys Phe Ala

```

```
<210> 101
<211> 150
<212> PRT
<213> Homo sapiens
```

```
<210> 102
<211> 100
<212> PRT
<213> Homo sapiens
```

44

<210> 103
 <211> 143
 <212> PRT
 <213> Homo sapiens

<400> 103
 Met Pro Glu Glu Asp Pro Ala Thr Leu Asp Asp His Ser Gly Thr Thr
 1 5 10 15
 Gly Thr Pro Lys His Phe Arg Asn Arg Lys Lys Ala His Phe Thr Ser
 20 25 30
 Phe Phe Ala Gly Asn Pro Arg Ile Gln His Phe Pro Gly Leu Pro Val
 35 40 45
 Arg Leu Arg Thr Gly Gly Pro Leu Cys Leu Gln Ala Phe Gly Gly Leu
 50 55 60
 Arg Ser Leu Gln Leu Leu Gly Gly Leu Cys Gln Pro Leu Ser Gln
 65 70 75 80
 Gly Ile Gly Gln Arg Lys Gly Arg Gly Thr Leu Ala Leu Gly Phe Ser
 85 90 95
 Ser Gln Arg Ser Gly Arg Gly Asp Thr Gly Met Gly Leu Ala Leu Tyr
 100 105 110
 Arg Gln Pro Gly Ser Ser Pro Leu Asp Leu Arg Leu Leu Arg Thr Thr
 115 120 125
 Arg Glu Gly Asp Val Arg Thr Leu Ser Cys Pro Pro Asp Gly Pro
 130 135 140 143

<210> 104
 <211> 65
 <212> PRT
 <213> Homo sapiens

<400> 104
 Met Asn Asn Ser Pro Leu Gly Ser Ser Phe Leu Gly Arg Leu Glu Glu
 1 5 10 15
 Val Pro Ser Pro Ser Pro Leu Pro Leu Val Ser Leu Pro Ser Gln Arg
 20 25 30
 Thr Ser Phe Ser Asn Ile Ala Pro Thr Thr Tyr Gln Tyr Cys Thr Pro
 35 40 45
 Gly Ser Cys Gln Ala Val His Ser Asn Ala Val Gly Gly Asn Thr Trp
 50 55 60
 Lys
 65

<210> 105
 <211> 56
 <212> PRT
 <213> Homo sapiens

<400> 105
 Met Phe Tyr Leu Pro Ile Gln Lys Val Pro Pro Pro Ser Leu Pro Gln
 1 5 10 15
 Leu Thr Val Thr Ile Thr Leu Ala Ile Thr Ile Leu Val Ser Leu Pro
 20 25 30
 Pro Asp Gly Ser Gln Leu Leu Leu Ser Ser Trp Pro Pro Gln Trp Leu
 35 40 45
 Ser His Val Tyr Leu Pro Leu Cys

50

55 56

<210> 106
 <211> 103
 <212> PRT
 <213> Homo sapiens

<400> 106
 Met Phe Leu Thr Ile Leu Leu Asn Cys Val His Ser His His Ala Pro
 1 5 10 15
 Val Phe Phe Gln Pro Arg Asn Ala Leu Thr Phe Asp Cys Gly Asp Asp
 20 25 30
 Val Glu Val His Arg Val Phe Thr Asp Pro Val Ile Leu Phe Cys Asp
 35 40 45
 Arg Gln Asn Gln Ser Ile Lys Arg Pro Ala Leu His Leu His Ile Pro
 50 55 60
 Gly Thr Ser Pro His Phe Arg Ile Arg Asp His Ser Val Ile Gln Pro
 65 70 75 80
 Asn Leu Ile Asn Lys Cys Ser Ser Pro Val Pro Gln Gln Ser Gln Met
 85 90 95
 Lys Asp Val Ile Met Trp Asn
 100 103

<210> 107
 <211> 65
 <212> PRT
 <213> Homo sapiens

<400> 107
 Met Leu Pro Pro Leu Cys Trp Cys Cys Val Arg Thr Met Thr Cys Cys
 1 5 10 15
 Ile Gly Thr Ser Thr Gly Met Asp Gly Arg Pro Pro Ser Pro Trp Arg
 20 25 30
 Arg Ile Pro Cys Trp Thr Gln Thr Cys Ser Cys Arg Asn Ser Ala Thr
 35 40 45
 Pro Ser Ser Pro His Phe Leu His Thr Ser Arg Trp Pro Gly Pro Met
 50 55 60
 Tyr
 65

<210> 108
 <211> 109
 <212> PRT
 <213> Homo sapiens

<400> 108
 Met His Ala Leu Phe Met Leu Phe Ser Leu Pro Ala Pro Gln Ser Leu
 1 5 10 15
 Tyr Leu Gln Asn Gly Asp Asn Thr Pro Ser Ala Cys Leu Ile Gln Arg
 20 25 30
 Arg Gly Ser Cys Leu Met Val Glu Phe Trp Ile Ser Asp Gln Val Arg
 35 40 45
 Glu Gly Ser Gly Lys Val Thr Glu Gly Ser Asp Leu Gly Gln Glu Ala
 50 55 60
 Ile Ser Gly Ala His Pro Ala Arg Asp Trp Gly Ser Leu Leu His Gly

65					70					75				80
Pro	Cys	Ile	Pro	Arg	Gly	Lys	Arg	Gly	Pro	Leu	Trp	Asn	Pro	Met Ala
				85					90					95
Pro	Cys	Ser	Ile	Ser	Lys	Cys	Gln	Gly	Ser	Trp	Asn	Val		
			100					105				109		

<210> 109
 <211> 173
 <212> PRT
 <213> Homo sapiens

<400> 109														
Met	Lys	Ala	Pro	Gln	Ser	Leu	Val	Lys	Gly	Ala	Gly	Asp	Pro	Glu Pro
1				5					10				15	
Asp	Leu	Trp	Ile	Ile	Gln	Pro	Gln	Glu	Leu	Val	Leu	Gly	Thr	Thr Gly
			20					25					30	
Asp	Thr	Val	Phe	Leu	Asn	Cys	Thr	Val	Leu	Gly	Asp	Gly	Pro	Pro Gly
			35				40					45		
Pro	Ile	Arg	Trp	Phe	Gln	Gly	Ala	Gly	Leu	Ser	Arg	Glu	Ala	Ile Tyr
			50			55					60			
Asn	Phe	Gly	Gly	Ile	Ser	His	Pro	Lys	Ala	Thr	Ala	Val	Gln	Ala Ser
					70					75				80
Asn	Asn	Asp	Phe	Ser	Ile	Leu	Leu	Gln	Asn	Val	Ser	Ser	Glu	Asp Ala
				85					90					95
Gly	Thr	Tyr	Tyr	Cys	Val	Lys	Phe	Gln	Arg	Lys	Pro	Asn	Arg	Gln Tyr
			100					105					110	
Leu	Ser	Gly	Gln	Gly	Thr	Ser	Leu	Lys	Val	Lys	Gly	Glu	Thr	Ile Gly
			115				120					125		
Phe	Gly	Leu	Val	Gly	Arg	Ala	Glu	Gln	Val	Phe	Asn	Arg	Asn	Phe Ser
			130			135					140			
Thr	Cys	Pro	Glu	Gln	Ala	Ser	Ser	Ser	Gln	Ala	Ser	Met	Ser	Leu His
					150					155				160
Lys	Phe	Phe	Pro	Leu	Pro	Gly	Met	Leu	Ser	Pro	Phe	Leu		
				165					170			173		

<210> 110
 <211> 64
 <212> PRT
 <213> Homo sapiens

<400> 110														
Met	Pro	Asp	Ser	Gly	Arg	Leu	His	Trp	Leu	Leu	Pro	Ser	Tyr	Asp Gly
1				5					10				15	
Ala	Ser	Ser	Val	Val	Leu	Pro	Ser	Ser	Gly	Phe	Pro	Pro	Leu	Gly Asn
			20					25					30	
Phe	Leu	Thr	Ile	Ser	Thr	Gly	Arg	Gln	Arg	Met	Ala	Ser	Gly	Pro Gly
			35				40					45		
Thr	Cys	Val	Phe	Leu	Ser	Phe	Met	Phe	Pro	Asn	Pro	Thr	Ile	Gly Met
			50			55					60			64

<210> 111
 <211> 42
 <212> PRT
 <213> Homo sapiens

<400> 111

```

Met Gln His Leu Arg Ser His Cys His Leu Phe Arg Gln Ala Leu Phe
 1              5              10              15
Leu Cys Ser His Leu His Leu Ile Ser Trp Leu Ser Ser Tyr Leu Thr
              20              25              30
Gly Val Asn Phe Leu Tyr Glu Leu Leu Phe
              35              40              42

```

<210> 112

<211> 82

<212> PRT

<213> Homo sapiens

<400> 112

```

Met Lys Asn Glu Pro Lys Ser Thr Ile Ser Cys Pro Ser Ser Tyr Val
 1              5              10              15
Leu Trp Gly Asn Val Val Arg His Lys Tyr His Leu His Met Gln Ala
              20              25              30
Thr His Cys Lys Thr Leu Gly Gln His Ser Ser Glu Asn Leu Cys Cys
              35              40              45
Leu Ser Thr Pro Gln Gly Ser His Cys Ile Val Ile Arg Pro Leu Pro
              50              55              60
Trp Gly Gln Glu Ala Glu Val His Ser Cys Ser Val Met Asn Cys Leu
              65              70              75              80
His Asp
              82

```

<210> 113

<211> 79

<212> PRT

<213> Homo sapiens

<400> 113

```

Met Trp Ala Asp Ser Ile Leu Ala Ser Leu Leu Leu Trp Pro His Gln
 1              5              10              15
Ser Leu Gln Leu Trp His His Pro His Leu Ala Asn Lys Asn Met Gly
              20              25              30
Val Pro Pro Pro Thr Thr Cys Lys Pro Trp Ser Thr Glu Ala Gln Lys
              35              40              45
Phe Ala Asp Tyr Ile Pro Phe Met Thr Thr Trp Pro Pro Leu Gly Lys
              50              55              60
Arg Lys Val Val Lys Phe Asn Leu Ala Val His Arg Cys Ser Thr
              65              70              75              79

```

<210> 114

<211> 169

<212> PRT

<213> Homo sapiens

<400> 114

```

Met Arg Leu Leu His Cys Lys Thr Leu His Ile Val Leu Phe Thr Leu
 1              5              10              15
Leu Tyr Lys Ile Leu Met Asp His Gln Asn Leu Ser Glu His Val Leu

```

```
<210> 115
<211> 68
<212> PRT
<213> Homo sapiens
```

```
<210> 116
<211> 415
<212> PRT
<213> Homo sapiens
```

49

```

      115      120      125
Glu Glu Glu Ile Gly Ala Val Gly Gly Ile Asp Tyr Asn Asp Thr Asn
  130      135      140
Gln Asn Ala Gln Ser Glu Gln Asn Gly Ser Ser Asp Leu Leu Cys Asp
  145      150      155      160
Leu Asn Thr Ser Ser Tyr Asp Thr Ser Ala Leu Cys Asn Gly Phe Pro
      165      170      175
Leu Glu Asn Ile Cys Thr Gln Val Ile Asp Gln Asn Gln Asn Leu His
      180      185      190
Gly Asp Ser Lys Gln Ser Asn Leu Thr Asn Gly Asp Cys Val Ala Ser
      195      200      205
Ser Asp Gly Thr Ser Lys Pro Ser Ser Ser Leu Ala Val Ala Ala Gln
      210      215      220
Leu Arg Glu Ile Ile Pro Ser Ser Ala Leu Pro Asn Gly Thr Val Gln
  225      230      235      240
His Ile Leu Met Pro Asp Asp Glu Gly Glu Gly Glu Leu Cys Trp Lys
      245      250      255
Lys Val Asp Leu Gly Asp Val Lys Asn Val Asp Val Leu Ser Phe Ser
      260      265      270
His Ala Pro Ser Phe Asn Phe Leu Ser Asn Ser Cys Trp Ser Lys Pro
      275      280      285
Lys Glu Asp Lys Ala Val Asp Thr Ser Asp Leu Glu Val Ala Glu Asp
      290      295      300
Pro Met Gly Leu Gln Gly Ile Asp Leu Ile Thr Ala Ala Leu Leu Phe
  305      310      315      320
Cys Leu Gly Asp Ser Pro Gly Gly Arg Gly Ile Ser Asp Ser Arg Met
      325      330      335
Ala Asp Ile Tyr His Ile Asp Val Gly Thr Gln Thr Phe Ser Leu Pro
      340      345      350
Ser Ala Ile Leu Ala Thr Ser Thr Met Val Gly Glu Ile Ala Ser Ala
      355      360      365
Ser Ala Cys Asp His Ala Asn Pro Gln Leu Ser Asn Pro Ser Pro Phe
      370      375      380
Gln Thr Leu Gly Leu Asp Leu Val Leu Glu Cys Val Ala Arg Tyr Gln
  385      390      395      400
Pro Lys Gln Ala Phe Asn Val Tyr Leu Cys Val Trp Thr Val Ile
      405      410      415

```

<210> 117
 <211> 77
 <212> PRT
 <213> Homo sapiens

```

      <400> 117
Met Cys Thr Phe Arg Gly Leu Leu Thr Gly Leu Leu Thr Phe Pro Leu
  1      5      10      15
Phe Ser Pro Val Leu Tyr Phe Cys Asn Lys Phe Pro Asn Lys Thr Asn
      20      25      30
Met Phe Leu Leu Cys Phe Cys Lys Asn Tyr Phe Leu Ser Thr Val Tyr
      35      40      45
Lys Val Phe Val Arg Gln Gly Leu Val Phe Ala Ala His Thr Ala Glu
      50      55      60
Ala Met Val Ala Val Glu Val Ala Arg Lys Arg Thr Arg
      65      70      75      77

```

<210> 118
 <211> 55
 <212> PRT
 <213> Homo sapiens

<400> 118

```

Met Leu Gln Arg Gly Cys Asn Asp Trp Val Leu Pro Cys Val Ser Glu
 1           5           10           15
Asn Gln Lys Gly Thr Ala Asp Leu Leu Val Phe Trp Ser Pro Val Val
           20           25           30
Ser Ala Glu His Cys His Trp Cys Pro Asp Ser Arg Pro Lys Leu Gly
           35           40           45
Lys His Cys Phe Trp Ser Cys
 50           55

```

<210> 119

<211> 145

<212> PRT

<213> Homo sapiens

<400> 119

```

Met Ala Ser Asn Gly Leu Arg Gln Ser Thr Gly Pro Gly Arg Gly Pro
 1           5           10           15
Ala Tyr Arg Gly Gln Gly Leu Glu Gln Ala Val Glu Ser Arg Val Pro
           20           25           30
Glu Ala Ser Gln Ala Gly Glu Gly Gly Gln Glu Pro Gln Glu Glu Ala
           35           40           45
Ala Val Asn Ile Leu Glu Tyr Leu Ala Leu Ile Gly Phe Trp Leu Phe
           50           55           60
Val Glu Leu Val Ser Glu Val Leu Ser Thr Arg Ile Val Gly Ala Glu
           65           70           75           80
Ala Glu Val Gly Val Glu Gly Pro Asp Pro Lys Glu Asp Ala Ser Arg
           85           90           95
Asp Trp Ala Thr Ala His Thr Tyr Leu Cys Tyr Ile Lys Gln Glu Lys
           100           105           110
Leu Gln Val Lys Gly Cys Gly Ala Gly Gly Tyr Leu Val Gly Asp Pro
           115           120           125
Thr Asn Ala Ile Ala His Pro Gly Leu Pro Ala Glu Ala Ala Ile Ile
           130           135           140
Tyr
145

```

<210> 120

<211> 74

<212> PRT

<213> Homo sapiens

<400> 120

```

Met Thr Ile Ser Gly Ser Gly Gln Glu Glu Ala Pro Arg Pro Ser Pro
 1           5           10           15
Gln Ser Phe Gln Glu Asp Thr His Pro Phe Pro Val Leu Leu Phe Met
           20           25           30
Leu Phe Leu Leu Ser Ser Lys Pro Ser Pro Leu Pro Phe Phe Leu Asn
           35           40           45
Pro Thr Thr Gln Gly Pro Ala Leu Thr Thr Pro Gly Leu Ser Pro Phe
           50           55           60
Ser Gly Glu Lys Thr Leu Arg Ser Leu Gln
           65           70           74

```

<210> 121
 <211> 77
 <212> PRT
 <213> Homo sapiens

<400> 121
 Met Ser Ala Met Cys Glu Lys Cys Asp Lys Ser Leu Cys Met Lys Thr
 1 5 10 15
 Trp Leu Lys Gln Ser His Trp Gln Glu Ala Ala Glu Leu Pro Val Gln
 20 25 30
 Tyr Leu Val Arg Arg Met Arg Tyr Thr Ala Ile Leu Leu Gly Leu Phe
 35 40 45
 Gln Cys Gly Glu Gly Glu Glu Tyr Asn Arg Arg Pro Glu Arg Ala Lys
 50 55 60
 Arg Thr Pro Gln Val Thr Leu His Ile Arg Glu Gly Leu
 65 70 75 77

<210> 122
 <211> 71
 <212> PRT
 <213> Homo sapiens

<400> 122
 Met Pro Ala Cys Cys Tyr Arg Pro Cys Leu Leu Gln Pro Ile Ser Leu
 1 5 10 15
 Leu Asn Ile Leu Leu Leu Leu Met Arg Lys Pro Ser Gln Glu Val Ile
 20 25 30
 Asn Asp Thr Pro Lys Ala Gly Lys Trp Leu Ser Arg Tyr Leu Asp Ser
 35 40 45
 Gly Leu Phe Tyr Ser Cys Ala Cys Gly Pro Phe Ser His Ser Phe Gln
 50 55 60
 Leu Asp Ser Phe Lys Asn Val
 65 70 71

<210> 123
 <211> 85
 <212> PRT
 <213> Homo sapiens

<400> 123
 Met Arg Gln Ser Ser Cys Leu Gln Gly Pro Phe Leu Asp Leu Gly Arg
 1 5 10 15
 Ala Tyr Lys Phe Cys Val Leu Val Gly Ser Glu Gly Arg Gly Asp Gly
 20 25 30
 Ala Val Val Leu Ile Pro Ala Thr Gly His Ala Asn Ser Thr Ser Pro
 35 40 45
 Gly Ser Cys Pro Lys Gln Glu Gly Arg Arg Met His Gly Ile Gly Val
 50 55 60
 Gly Val Glu Met Arg Ala Ala Thr Trp Arg Glu Glu Asp Leu His Leu
 65 70 75 80
 Lys Ser Thr Gln Val
 85

<210> 124
 <211> 46

<212> PRT

<213> Homo sapiens

<400> 124

```

Met Ser Leu Gly Asp Asn Leu Leu Phe Lys Ala Lys Ile Thr Thr Val
 1          5          10          15
His Cys Val Val Ser Val Lys Val Tyr Glu Asn Asn Ser Thr Lys Asn
          20          25          30
Thr Glu Gly Arg Asn Ser Cys Gly Leu Glu Ala Val Lys Cys
          35          40          45 46

```

<210> 125

<211> 61

<212> PRT

<213> Homo sapiens

<400> 125

```

Met Phe Met Pro Gly Thr Val Leu Arg Ile Leu Leu Ala Leu Pro Tyr
 1          5          10 ~          15
Leu Ile Leu Thr Lys Gln Val Gln Phe Phe Leu Phe Ser Asp Glu Ile
          20          25          30
Met Ala Trp Lys Val Val Ala Pro Gly Leu Glu Leu Ser Ala Val Thr
          35          40          45
Pro Asp Ser Thr Leu Phe Asn His Tyr Thr Ile Leu Ser
          50          55          60 61

```

<210> 126

<211> 82

<212> PRT

<213> Homo sapiens

<400> 126

```

Met Gln Val Lys Phe Ile Leu Lys Tyr Tyr Ile Ser Phe Leu Trp Lys
 1          5          10          15
Thr Val Thr Ala Asn Gly Glu Thr Val Asn Met Ser Leu Leu Tyr Ile
          20          25          30
Phe Thr Thr Met Glu Met Arg Lys Ser Glu Val Gly Leu His Leu
          35          40          45
Pro Ile Ser Ile Leu Lys Pro Phe Phe Thr Ile Val Leu Asp Glu Lys
          50          55          60
Ile Val Thr Gly Gln Val Trp Gly Gly Glu Leu Phe Leu Leu Phe Cys
          65          70          75          80
Lys Asp
          82

```

<210> 127

<211> 64

<212> PRT

<213> Homo sapiens

<400> 127

```

Met Val Leu Thr Ser Glu Asp Arg Gln Phe Tyr Leu Leu Thr Asp Ser
 1          5          10          15
Phe Lys Leu Phe Tyr Gly Met Leu Lys Glu Thr Arg Ile Asn Lys Ser

```

			20					25					30			
Thr	Thr	Phe	Gly	Leu	Asp	Cys	Asn	Lys	Ile	Phe	His	Lys	Ser	Lys	Asp	
		35					40					45				
Leu	Leu	Gly	Asn	Glu	Gly	Lys	Gln	Arg	Gly	Cys	Lys	Asn	His	Leu	Lys	
	50					55					60				64	

```
<210> 128
<211> 81
<212> PRT
<213> Homo sapiens
```

[illegible]

```
<210> 129
<211> 73
<212> PRT
<213> Homo sapiens
```

```

      <400> 129
Met Cys Pro Leu Leu Val Tyr Lys Ile Ile Leu Val Phe Ala Ala Met
  1             5             10             15
Phe Phe Phe Ser Gln Gly Ser Gln Val Glu Ile Arg Ser His Glu Gly
      20             25             30
Glu His Cys Val Gly Thr Val His Leu Leu Ser His Phe Leu Tyr Ser
      35             40             45
Lys Asn Asn Pro Val Phe Tyr Lys Gly Asn Thr Ser Phe Ile Phe Glu
      50             55             60
Thr Met Glu Glu Asp Ser Leu Ser Ser
      65             70             73

```

```
<210> 130
<211> 60
<212> PRT
<213> Homo sapiens
```

<400> 130

Met	Ala	Val	Ser	Glu	Leu	Asp	Arg	His	Thr	Phe	Asn	Arg	Gln	Gly	Cys
1				5					10					15	
Gly	Lys	Ser	Lys	Ile	Lys	Ala	Gly	Lys	Arg	Thr	Gln	His	Val	Ser	Ser
			20					25					30		
Leu	Ser	Ser	Leu	Ser	Ala	Lys	Trp	Leu	Arg	Val	Glu	Met	Met	Arg	Glu

```
<210> 131
<211> 101
<212> PRT
<213> Homo sapiens
```

```
<210> 132
<211> 46
<212> PRT
<213> Homo sapiens
```

```
<210> 133
<211> 76
<212> PRT
<213> Homo sapiens
```

55

<210> 134
 <211> 53
 <212> PRT
 <213> Homo sapiens

<400> 134
 Met Ile Leu Val Ser Leu Leu Ile Leu Ile Val Glu Pro Leu Phe Ala
 1 5 10 15
 Ser Leu Thr Pro Leu Ser Leu Cys Phe Glu Cys Val Val Phe Leu Asn
 20 25 30
 Val Gly Gln His Leu Thr Asp Gln Thr Phe Ser Leu Asn Gly Leu Leu
 35 40 45
 Phe Leu Ser Asn Ser
 50 53

<210> 135
 <211> 67
 <212> PRT
 <213> Homo sapiens

<400> 135
 Met Ser Pro Leu Leu Pro Leu Ser Tyr Lys Leu Val Leu Cys Phe Pro
 1 5 10 15
 Thr Pro Asn Gly Val Val Thr His Gly Glu Gln Asn Ala Ser Ser Thr
 20 25 30
 Asp Ile Glu His Gly Leu Lys Thr Ile Leu Ile Lys Pro Pro Ala Arg
 35 40 45
 Ile Leu Lys Arg Lys Thr Glu Gly Glu Glu Ser Asn Arg Leu Thr Leu
 50 55 60
 Pro Thr Thr
 65 67

<210> 136
 <211> 86
 <212> PRT
 <213> Homo sapiens

<400> 136
 Met Gly Pro Val Ser Gly Cys Trp His Met Ser Leu Cys Leu Arg Val
 1 5 10 15
 Tyr Leu Ala Leu Asp Pro Ala His Gln Glu Leu Met Pro Pro Gly Ser
 20 25 30
 Thr Leu Gln Pro Ile Thr Leu Arg Ile Gly Ile Glu Ile Leu Gln Pro
 35 40 45
 Pro Thr Leu Glu Val Gly Asn Ser Glu Ala Leu Ser Val Pro Ser Arg
 50 55 60
 Thr Thr Pro Arg Arg Thr Glu Leu Pro Trp Pro Thr Glu Leu Thr Gly
 65 70 75 80
 Phe Leu Ile Asn Thr Leu
 85 86

<210> 137
 <211> 52

<212> PRT
<213> Homo sapiens

<400> 137
Met His Thr Cys Val Pro Glu Arg Leu Phe Gln Cys His His Leu Ile
1 5 10 15
Arg Ile Thr Cys Leu Phe Met Ile Leu Glu Phe Arg Leu Phe Lys Tyr
20 25 30
Gly Ser Asn Val Cys Ser His Val Ile Ile Asn His Pro Gln Val Gln
35 40 45
Gly Arg His Arg
50 52

<210> 138
<211> 114
<212> PRT
<213> Homo sapiens

<400> 138
Met Gly Gln Val Thr Cys Ser Gln Val Asn Ala Ser His Thr Tyr Asp
1 5 10 15
Leu Thr Ser Ala Pro His Met Asn Asn Ser Ala Gln Pro Tyr Ala His
20 25 30
Ser Gln Gly Ser Thr Cys Val Ala Ser Phe Ser Arg Leu Met Ser Gly
35 40 45
Ile Pro Leu Ser Asn Ile Ser Ala Ile Phe Tyr Glu Thr Ile Phe Leu
50 55 60
Asp Gly Gln Phe Leu Ala Ser Gln Glu Thr Asp Glu Glu Ala Arg Arg
65 70 75 80
Met Tyr Trp Glu Ser Pro Ala Glu Glu Glu Leu Leu Arg Ser Glu Trp
85 90 95
Arg Ser Tyr Leu Leu His Val Gly Arg Ser Cys Ser Ala Val Tyr Ser
100 105 110
Ile Phe
114

<210> 139
<211> 60
<212> PRT
<213> Homo sapiens

<400> 139
Met Ser Leu Arg Ile Arg Ala Ala Arg Asn Trp Ala Arg Asp Val Gln
1 5 10 15
Lys Leu Trp Thr Ile Val Val Leu Leu Val Leu Ile Leu Ile Arg Ser
20 25 30
Ala Val Asn Leu Leu Ile Asn Ser Arg Thr Glu Asp Lys Ser Leu Gln
35 40 45
Leu Val Leu Tyr Gln Ser Val Ile Ile Cys Phe Pro
50 55 60

<210> 140
<211> 58
<212> PRT
<213> Homo sapiens

<400> 140

```

Met Val Trp His Val Arg Lys Ser Ser Phe Val Trp Leu Leu Gln Leu
 1           5           10           15
Phe Ser Phe Ile Ser Cys His Ser Val Ile Ser Val Ser Pro Val His
           20           25           30
Val Pro Trp Thr Gln Cys Ala Val Ile Pro Pro Tyr Thr Ser Cys Pro
           35           40           45
Lys Leu Phe Ala Ile Gln Gly Gly Arg Phe
 50           55           58

```

<210> 141

<211> 80

<212> PRT

<213> Homo sapiens

<400> 141

```

Met Gly Gly Phe Lys Val Asn Leu Phe Val Lys Val Lys Ala Glu Gly
 1           5           10           15
Ser Pro Leu Cys Trp Leu Lys Leu Ala Cys Leu Gly Ala Trp Leu Leu
           20           25           30
Ser Leu Leu Ile Ser Gln Lys Ser Asp Glu Gln Leu Cys Phe Gly Leu
           35           40           45
Leu Thr Trp Asn Phe Ser Thr Ser Asp Ser Ile Leu Val Trp Phe Val
 50           55           60
Gly Pro Arg Ala Gly Thr Gln Ser Lys Pro Val Val Ser Tyr Lys Phe
 65           70           75           80

```

<210> 142

<211> 58

<212> PRT

<213> Homo sapiens

<400> 142

```

Met Phe Ser Cys Ile Thr Thr Phe Ser Thr Glu His Asn Ile Tyr Ser
 1           5           10           15
Ser Lys Lys Glu Lys Arg Lys Leu Leu Gln Thr Pro Asp Pro Asp Gln
           20           25           30
Phe Pro Arg Asp Cys Thr Ile Thr Leu Gln Ala Ala Leu Thr Leu Pro
           35           40           45
Pro Ala Ile Lys Lys Gln Ile Asn Pro Ile
 50           55           58

```

<210> 143

<211> 72

<212> PRT

<213> Homo sapiens

<400> 143

```

Met Cys Ala Phe Leu Leu Pro Phe Lys Leu Leu Phe Phe Leu Glu Ile
 1           5           10           15
Ser Leu Ala Met Lys Ser His Phe Pro Phe Thr Leu Leu Met Leu Ser

```

<400> 146															
Met	Ile	Ser	Met	Leu	Pro	Arg	Pro	Ser	Val	Thr	Asn	Thr	Asn	Cys	Phe
1				5					10					15	
Tyr	Leu	Ala	Leu	Gln	Thr	Cys	Phe	Leu	Arg	Gly	Arg	Ala	Arg	Leu	Cys
			20					25					30		
Lys	Val	Lys	Lys	Asn	Arg	Thr	Lys	Pro	Asn	Thr	Arg	Thr	Leu	Arg	Leu
		35					40					45			
Phe	Tyr	Thr	Pro	Leu	Phe	Ser	Gly								
	50					55	56								

<210> 147
 <211> 44
 <212> PRT
 <213> Homo sapiens

<400> 147
 Met Tyr His Asn Val Ser Thr Gly Leu Leu Asn Ile Arg His Gln Ser
 1 5 10 15
 Gln Asn Ser Leu Ile Gly Ser Thr Cys Thr Cys Leu Val Asn Ala Ser
 20 25 30
 Met Asp Met Ser Ile Gln Leu Val Thr Tyr Arg Thr
 35 40 44

<210> 148
 <211> 60
 <212> PRT
 <213> Homo sapiens

<400> 148
 Met Ile Gly Phe Ile Ile Phe Pro Ser Glu Ile Met Ala Thr Arg Ser
 1 5 10 15
 Lys Gly Ala Phe Ile Asn Cys Tyr Ile Ile Leu Leu Leu Thr Phe Leu
 20 25 30
 Met Ile Arg Thr Phe Tyr Asn Leu Met Glu Tyr Tyr Cys Pro Thr Leu
 35 40 45
 Leu Ile Arg Lys Leu Met Ser Asn Thr Lys Ile Leu
 50 55 60

<210> 149
 <211> 100
 <212> PRT
 <213> Homo sapiens

<400> 149
 Met Lys Lys Leu Glu Phe Ser Met Arg Leu Gly Gly Trp Val Val Gly
 1 5 10 15
 Met Glu Leu Ser Gln Ser His Lys Val Asn Gly Pro Ser Ser Gln Phe
 20 25 30
 Leu Gly Ser Val Val Gln Leu Met Thr Arg Ser Trp Ala Trp Leu Phe
 35 40 45
 Glu Arg Val Ile Ser Cys Gly Ala Gln Val Lys Thr Thr Gly Thr Gly
 50 55 60
 Glu Phe Lys Val Asn Met Trp Leu Gly His Leu Ser Val Pro Gln Ser
 65 70 75 80
 Ser His Asp Ala Val Ser Val Ala Gly Lys Ser Tyr Arg Gly Leu Leu
 85 90 95
 Glu Asn Val Glu
 100

<210> 150
 <211> 85
 <212> PRT
 <213> Homo sapiens

<400> 150
 Met Asp Phe Leu Ser Arg Leu Met Leu Leu Arg Met Cys Lys Cys Val
 1 5 10 15
 Thr Ala Thr Tyr Gln Tyr Ile Arg Arg Ser Leu Phe Leu Asn Leu Val
 20 25 30
 Pro Leu Leu Gln Thr Leu Ser Ile Leu Thr Ala His Ser Val Leu Leu
 35 40 45
 Arg Pro Ala Leu Ser Ser Leu Val Lys Met Glu Asp Ser Gln Ala Leu
 50 55 60
 Ser Leu Ser Leu Glu Pro Val Ser Ala Ile Leu Thr Val Pro Pro Glu
 65 70 75 80
 Asp Ser Lys Val Leu
 85

<210> 151
 <211> 133
 <212> PRT
 <213> Homo sapiens

<400> 151
 Met Val Gln Ala Arg Gly Phe Leu Leu Pro Gln Asn Arg Leu Ser Gly
 1 5 10 15
 Gln Gly Cys Leu Cys Ala Cys Asp Ser His Glu Thr Asn Ser Leu Cys
 20 25 30
 Ala Val Thr Thr His Trp Phe Gln Arg Gln Asn Ile His Gly Lys Ser
 35 40 45
 Arg Leu Lys Ser Arg Glu Gly Arg Val Ala Arg Arg Ile Arg Pro Gly
 50 55 60
 Leu Asp Arg Pro Gly Gly Asn Thr Asp Pro Ser Arg Phe Trp Leu Pro
 65 70 75 80
 Gly Ala Leu Ser His Ile Gly Leu Asp Leu Asn Arg Leu Tyr Ser Leu
 85 90 95
 Ile Phe Pro Ser Pro Pro Leu Ser Leu Asp Pro Leu Pro Pro His Pro
 100 105 110
 Thr Ser Leu Cys Ser Cys His Phe Leu Gln Ala Lys Ser Gly Glu Ile
 115 120 125
 Val Asp Pro Gly Ile
 130 133

<210> 152
 <211> 57
 <212> PRT
 <213> Homo sapiens

<400> 152
 Met Arg Met Thr Thr Ser Ser Leu Val Leu Pro Pro Leu Phe Val Leu
 1 5 10 15
 Lys Cys Gln Arg Phe Tyr Pro Pro Leu Tyr Leu His Pro Tyr Ser Ile
 20 25 30
 Cys Gln His Val Ser Ile Leu Val Lys Asn Ser Leu Gly Pro Gly Gly
 35 40 45
 Ser Lys Val Pro Thr Leu Gly Asn His
 50 55 57

<210> 153
 <211> 126

<212> PRT

<213> Homo sapiens

<400> 153

```

Met Gly Lys Gln Leu Ser Cys Tyr Leu Leu Gly Ile Trp Gln Val Pro
 1           5           10           15
Val Pro Cys Leu His Cys Leu Pro His Gly His Leu Ser Val Leu Glu
           20           25           30
Pro Leu Gly Gly Cys Val Leu Lys Arg Ile Leu Arg Gly Leu Ala Val
           35           40           45
Arg Thr Leu Ser Leu Leu Ser Val Leu Ser Pro Asp Arg Ala Ala Val
           50           55           60
Val Gly Ser Pro Arg Pro His Gly His Lys Cys Leu Leu Ala Ser Ile
           65           70           75           80
Arg Val Asp Val Pro Asp Ser Cys Ser Gly Leu Arg Leu Pro Gly Pro
           85           90           95
Pro His Ser Ala Ser Phe Leu His Ile Leu Gly Thr Asn Leu Cys Ile
           100          105          110
Ser Cys Leu Ala Pro Pro Gln Asn Val Leu Thr Glu Gly Arg
           115          120          125 126

```

<210> 154

<211> 91

<212> PRT

<213> Homo sapiens

<400> 154

```

Met Val Phe Val Gly Lys Cys Thr Gln Ser Ser Asn Leu Ser Phe Leu
 1           5           10           15
Arg Phe Leu Ile Pro Val Thr Met Ala Lys Gly Thr Pro Pro Ser Leu
           20           25           30
Phe Phe His Leu Ser Pro Gly Gly Lys Ile Lys Val His Arg Asp Thr
           35           40           45
Phe Pro Phe Thr Phe Pro His Ala Asn Arg Asp Pro Thr Leu Asp Cys
           50           55           60
Arg Ala Met Gly Arg Gly Asp Pro Gly Ser Ser Trp Leu Cys Asp Asn
           65           70           75           80
Arg Gly Lys Arg Arg Gly Gly Arg Glu His Arg
           85           90 91

```

<210> 155

<211> 96

<212> PRT

<213> Homo sapiens

<400> 155

```

Met Leu Pro Ser Phe Leu Pro Gln Ser Leu Gly Asn Leu Ile His Thr
 1           5           10           15
Leu Gly Phe Leu Leu Ile Ile His Lys Tyr Met Ser Ala Phe Lys Asn
           20           25           30
Arg Thr Asp Glu Phe Met Asn Met Gly Met Gln Pro Tyr Ile Lys Ser
           35           40           45
Pro Tyr Arg Leu Ser Met Ser Gln Ile Ser Leu Lys Phe Asp Leu Ser
           50           55           60
Gln Thr Asp Leu Ile Leu Pro His Lys Phe Tyr Ser Pro Ser Ser Phe
           65           70           75           80
Pro Thr Val Met Leu Phe Tyr Ser Phe Gly Arg Leu Ser His Lys Pro

```

85

90

95 96

<210> 156
 <211> 63
 <212> PRT
 <213> Homo sapiens

<400> 156
 Met Gly Tyr Thr Val Lys Arg Glu Cys Leu Leu Ile Val Leu Met Gln
 1 5 10 15
 Ala Trp Arg Ser Phe Val Met Gly Val Glu Val Leu Met Tyr Ile Val
 20 25 30
 Ala Val Arg Cys Arg Ala Asp Phe Ala Thr Ser Leu Trp Gln Pro Trp
 35 40 45
 Cys Tyr Thr Arg Ala Gly Gly Gln Phe Asn Val Ser Gln Ala Arg
 50 55 60 63

<210> 157
 <211> 77
 <212> PRT
 <213> Homo sapiens

<400> 157
 Met Val Val Leu Tyr Ile Val Arg Ala Tyr Asn His Tyr Ile Leu Cys
 1 5 10 15
 Cys Leu Ser Ser Ser Leu Tyr Leu Val Leu Ile Leu Leu Val Thr Val
 20 25 30
 Tyr Leu Met Leu Thr Thr Ser Ser Tyr Asn Asp Val Ser Leu Val Ile
 35 40 45
 Trp Ile Ala Ser Ser Phe Ala Ser Ser Lys Phe Phe Arg Lys Gly Leu
 50 55 60
 Arg Glu Tyr Ser Tyr Phe Met Asn Phe Leu Ala Arg Ser
 65 70 75 77

<210> 158
 <211> 92
 <212> PRT
 <213> Homo sapiens

<400> 158
 Met Leu Glu Trp Pro Leu Leu Gly Gln Ile Leu Pro Met Ile Ile Pro
 1 5 10 15
 Leu Pro Pro Leu Pro Ala Leu Val Val Trp Pro Ile Gly Leu Thr His
 20 25 30
 Cys Pro Trp Pro Ser Pro Phe Val Pro Ala Ser Leu Asp Gly Phe Tyr
 35 40 45
 Asn Ser Arg Ser Leu Asp Gly Lys Ser Pro Pro Leu Arg Pro Glu Lys
 50 55 60
 Trp Ser Pro Trp Ser Trp Phe Ser Arg Leu Pro Gly His Gly Leu Pro
 65 70 75 80
 Lys Glu Gly Gly Gln Arg Lys Arg Glu Val Trp Ala
 85 90 92

<210> 159
 <211> 56
 <212> PRT
 <213> Homo sapiens

<400> 159
 Met Met Leu Trp Gln Val Tyr Pro Gly Pro Ser Ala Gln Glu Leu Cys
 1 5 10 15
 Leu Phe Leu His Ala Pro Trp Ser Met Ser Thr Ala Val Glu Arg Asp
 20 25 30
 Lys Arg Gln Lys Asp Gly Arg Ser His Arg Met Leu Leu Pro Gln Pro
 35 40 45
 Gln Ser Leu Met Ser Arg Cys Cys
 50 55 56

<210> 160
 <211> 66
 <212> PRT
 <213> Homo sapiens

<400> 160
 Met Ile Glu Lys Lys Ser Met Phe Phe Cys Leu Thr Arg Gln Ser Leu
 1 5 10 15
 Leu Cys Thr Leu Leu Leu Met Leu Lys Arg Cys Ile Phe Phe Ser Tyr
 20 25 30
 Cys Val Ile Cys Arg Ala Lys Ser Phe Glu Leu Phe Thr Ser Glu Ile
 35 40 45
 Thr Phe Pro Asp Lys Arg Ala Lys Gln Cys Leu Phe Lys Leu Phe Ser
 50 55 60
 Gly Thr
 65 66

<210> 161
 <211> 109
 <212> PRT
 <213> Homo sapiens

<400> 161
 Met His Pro Tyr Ser Pro Ser Leu Leu Val Pro Gly Arg Gly Asn Thr
 1 5 10 15
 His Leu Ala Arg Ser Val Pro Pro His Thr Leu Pro Ser Pro Pro His
 20 25 30
 Ser Arg Tyr Pro Ala Leu Pro Thr Leu His Arg Trp Gly Pro Ala Pro
 35 40 45
 Arg Pro Pro Pro Leu Pro Val Ser Ala Ala Ala Pro Pro Gly His His
 50 55 60
 Thr Pro Ser Arg Pro Pro Pro Pro Ser Ser Leu Cys Ala Lys Pro His
 65 70 75 80
 Ile Pro Pro Leu Pro Arg Pro Arg Ile Thr Ala Arg Ser Pro Thr His
 85 90 95
 Pro Ala Arg Pro Ser Ala Ser Pro Arg Ala Pro His Arg
 100 105 109

<210> 162
 <211> 69
 <212> PRT
 <213> Homo sapiens

<400> 162
 Met Ser Ile Leu Val Val Ser Ala Phe Leu Ala Asn Leu Arg Leu Leu
 1 5 10 15
 Met Thr Ile Ser Thr Ser Gln Met Leu Asn Met Thr Lys Ile Thr Tyr
 20 25 30
 Leu Val Leu Phe Leu His Leu Ser Ala Leu Arg Ile Gly Ser Thr Pro
 35 40 45
 His Ser Phe Leu Leu Lys Ser Tyr His Leu Gly Thr His Phe Ser Leu
 50 55 60
 Phe His Met Asn Ser
 65 69

<210> 163
 <211> 43
 <212> PRT
 <213> Homo sapiens

<400> 163
 Met Phe Val Phe Val Ser Ile His Thr Glu Leu Val Pro Ile Leu Arg
 1 5 10 15
 Pro Leu Cys Leu Leu Tyr Cys Cys Pro Asp Cys Ser Val Pro Arg Pro
 20 25 30
 Leu Tyr Ser Leu Lys Tyr Leu Leu Leu Glu Lys
 35 40 43

<210> 164
 <211> 52
 <212> PRT
 <213> Homo sapiens

<400> 164
 Met Met Arg Val Ile Ile Leu Ile Trp Phe Arg Ile Ser Lys Gly Thr
 1 5 10 15
 Phe Gln His Ser Thr Thr Lys Cys Asp Val Cys Phe Arg Val Phe Leu
 20 25 30
 Leu Ser Asn Cys Ser Phe Leu Ser Leu Asn Tyr Lys Leu Thr Ser Asp
 35 40 45
 Phe Ile Ile Tyr
 50 52

<210> 165
 <211> 62
 <212> PRT
 <213> Homo sapiens

<400> 165
 Met Gln Met Val Val Pro Arg Leu Leu Ser Val Pro Gln Leu Leu Asn
 1 5 10 15
 Thr Ala Pro Leu Phe Leu Pro Trp Glu Lys Thr Val Lys Thr Gln Tyr

```
<210> 166
<211> 92
<212> PRT
<213> Homo sapiens
```

```
<210> 167
<211> 45
<212> PRT
<213> Homo sapiens
```

```
<210> 168
<211> 79
<212> PRT
<213> Homo sapiens
```

66

<210> 169
 <211> 68
 <212> PRT
 <213> Homo sapiens

<400> 169
 Met Lys Lys Lys Glu Arg Gly Tyr Val Leu Glu Thr Gln Ile Leu Leu
 1 5 10 15
 Gly Phe Gln Ile Leu Ala Val Asn Lys Leu Thr Ser Leu Val Asn Ala
 20 25 30
 Tyr Ala Phe Pro Asp Phe Asn Gln Arg Ile Glu Phe His Thr Leu Lys
 35 40 45
 Gly Leu Gly Glu Lys Lys Gln Gln Thr Lys Pro Lys Ser Leu Gly Asn
 50 55 60
 Gly Lys Lys Glu
 65 68

<210> 170
 <211> 11
 <212> PRT
 <213> Homo sapiens

<400> 170
 Met His Ile Arg Ile Ser Met Gln Val Leu Ser
 1 5 10 11

<210> 171
 <211> 60
 <212> PRT
 <213> Homo sapiens

<400> 171
 Met Pro Asn Arg Ile Glu Leu Ser Ala Leu Phe Arg Val Pro Phe His
 1 5 10 15
 Val Asp Trp Leu Cys Tyr Val Leu Gly Phe Cys Leu Pro Ser Thr Val
 20 25 30
 Lys Thr His Ser Leu Ile Val Gly Ala Val Phe Gln Ser Glu Ile Val
 35 40 45
 Thr Asn Val Cys Gln Ile Tyr Lys Cys Lys Thr Thr
 50 55 60

<210> 172
 <211> 123
 <212> PRT
 <213> Homo sapiens

<400> 172
 Met Lys Ala Arg Ser Asp Arg Thr Gly Arg Glu Leu Gly Ser Ser Val
 1 5 10 15
 Ser Thr Pro Arg Ala Leu Ser Arg Arg Cys Glu Gly Trp Phe Phe Ser
 20 25 30
 Gln Gly Thr Ala Val Thr Ser Ala Ile Glu Ile Gly Pro Glu Arg Lys

```

      35      40      45
Pro Ser Arg Glu Tyr Asn Val Arg Gly Gly Ala Trp Gly Met Gly Met
  50      55      60
Arg Ala His Gly Pro Arg Ser Ala Gly Glu Gly Cys Lys Ser Ser Ala
  65      70      75      80
Ala Pro Val Asp Arg Gly Glu Gly Ile Gly Pro Ser Ala Arg Gly Arg
      85      90      95
Val Cys Val Val Lys Arg Arg Arg Lys Thr Gly Arg Ser Ser Glu Gln
      100      105      110
Ala Glu Ser Gly Leu Gly Gly Glu Gly Ile Arg
      115      120      123

```

<210> 173
 <211> 56
 <212> PRT
 <213> Homo sapiens

```

<400> 173
Met Pro Leu Leu Tyr Ile Ile Cys Leu Arg Gln Leu Val Leu Phe His
  1      5      10      15
Ser Lys Cys His Ser Gln His Ser Cys Arg Ala Gly Gly Ile Gln Tyr
      20      25      30
Ser Met His Val Ser Leu Phe Leu Ser Ser Pro Ile Asn Tyr Asp Asn
      35      40      45
Gly Phe Leu Val Ser Pro Thr Phe
      50      55      56

```

<210> 174
 <211> 97
 <212> PRT
 <213> Homo sapiens

```

<400> 174
Met Pro Pro Lys Tyr Leu His Arg Thr Leu Ala Thr His Ser Ser Pro
  1      5      10      15
Pro Val Pro Pro Pro Val Phe Ser Asn Gln Gln Met Val Pro Ser Ala
      20      25      30
Ala Gln Gly Trp Ser Leu Gln Pro Glu Gly Thr Leu Asp Ser Ser Leu
      35      40      45
Ser Leu His Ser Gln Pro Ile Lys Gln Ile Leu Leu Ile Pro Pro Pro
      50      55      60
Lys Tyr Ile Cys Lys Ser Cys Cys Ile Leu Cys Cys Ile Ser Leu Pro
      65      70      75      80
Leu Tyr Leu Pro Glu Ile Leu Ser Ile Leu Arg Asn Arg Arg Pro Arg
      85      90      95
Asn
97

```

<210> 175
 <211> 310
 <212> DNA
 <213> Homo sapiens

```

<400> 175
gatttggtcca tttcatcaaa gttgggggaat ttatgtgcat agagttatgc ataatatcc

```

60

cctgtagtgat	gtcttctcct	tcattcttca	tatttagtgc	tgaaaacaat	aacaatgatt	120
tatttctcat	tctgatgggt	cttctcctgg	tctctcttgg	gcttactctg	gctgtattgg	180
tagattggct	acagctggag	gatctaaaaa	tggcctcacc	catatgtttg	gggccttgat	240
ggggatgact	ggagtagctg	agacttgtct	ctccctggat	tcattgggaa	ccaaaatgat	300
ctgccatgtg						310

<210> 176

<211> 5291

<212> DNA

<213> Homo sapiens

<400> 176

tttcgtggat	ctgataaatg	cctgtagtca	ttatggctta	atztatccat	gggttcacgt	60
cgtaatatca	tctgattctt	tagctgataa	aaattataca	gaagatcttt	caaaattaca	120
gtctcttata	tgtggctcct	catttgacat	agcttccatt	attccgttct	tggagccact	180
ttcagaagac	actattgccg	gcctcagtg	ccatgttctg	tgtcgtacac	gcttgaaaga	240
gtatgaacag	tgcatagaca	tactgttaga	gagatgcccg	gaggcagtca	ttccatatgc	300
taatcatgaa	ctgaaagaag	agaaccggac	tctgtgggtg	aaaaaactgt	tgcctgaact	360
ttgtcagaga	ataaaatgtg	gtggagagaa	gtatcaactc	tacctgtcat	cattaaaaga	420
aacattgtca	attgttgcctg	tggaaactaga	actgaaggat	ttcatgaatg	ttctcccaga	480
agatgggtact	gcaacatttt	tcttgccata	tcttctctat	tgcagtcgaa	agaaaccatt	540
gacttaaagg	tatcatttga	aaaataccat	aatggcattt	gagactgaat	ttctaaaaat	600
tgaatgccaa	agtacaagta	gaggagtttt	ttattttata	tatcacacac	acacacacac	660
acacacacac	acacacacac	atatatgata	caaatgcttt	caggctgctt	accttaccgt	720
gtagtggta	ctattcactt	cttaattttat	gacctcaatc	aatttaattg	tctagaattg	780
aaaaagctct	taagacataa	gaattcctca	aagaagccat	acatttttta	aggtagggat	840
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<211> 2186

<212> DNA

<213> Homo sapiens

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<211> 1191

<212> DNA

<213> Homo sapiens

<220>

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<211> 322

<212> DNA

<213> Homo sapiens

<400> 179

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<211> 1617

<212> DNA

<213> Homo sapiens

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<211> 3592

<212> DNA

<213> Homo sapiens

<400> 181

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<210> 182

<211> 1256

<212> DNA

<213> Homo sapiens

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<210> 183

<211> 358

<212> DNA

<213> Homo sapiens

<400> 183

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<210> 184

<211> 3320

<212> DNA

<213> Homo sapiens

<400> 184

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<210> 185

<211> 435

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<222> (1)...(435)

<223> n = a,t,c or g

<400> 185

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<210> 186
 <211> 827
 <212> DNA
 <213> Homo sapiens

<220>
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 <222> (1)...(827)
 <223> n = a,t,c or g

<400> 186
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<210> 187
 <211> 689
 <212> DNA
 <213> Homo sapiens

<400> 187
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 ataaaatcat gggagagggc aaaaaaaaaa 689

<210> 188
 <211> 1127
 <212> DNA
 <213> Homo sapiens

<400> 188
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<210> 189
 <211> 372
 <212> DNA
 <213> Homo sapiens

<400> 189						
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<210> 190
 <211> 2653
 <212> DNA
 <213> Homo sapiens

<220>
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 <223> n = a,t,c or g

<400> 190						
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<210> 191
 <211> 793
 <212> DNA
 <213> Homo sapiens

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<210> 192
 <211> 2311
 <212> DNA
 <213> Homo sapiens

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<210> 193

<211> 832

<212> DNA

<213> Homo sapiens

<400> 193

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<210> 194

<211> 320

<212> DNA

<213> Homo sapiens

<400> 194

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<210> 195

<211> 655

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<222> (1)... (655)

<223> n = a,t,c or g

<400> 195

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<210> 196

<211> 1298

<212> DNA

<213> Homo sapiens

<400> 196

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<210> 197
 <211> 1298
 <212> DNA
 <213> Homo sapiens

<400> 197						
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<210> 198
 <211> 566
 <212> DNA
 <213> Homo sapiens

<400> 198						
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<210> 199
 <211> 842
 <212> DNA
 <213> Homo sapiens

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<400> 199
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gg

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<210> 200
<211> 277
<212> DNA
<213> Homo sapiens

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<400> 200
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ttgtggcccc accagtctct acagctgtgg caccacccac atcttgctaa taagaacatg      180
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<210> 201
<211> 597
<212> DNA
<213> Homo sapiens

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<220>
<221> misc_feature
<222> (1)...(597)
<223> n = a,t,c or g

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<400> 201
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tgcatggttt tatactctgat tgaattagga cttgaaaatt ctgctgaaga agaatcagat      180
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<210> 202
<211> 654
<212> DNA

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<213> Homo sapiens

<400> 202

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<210> 203

<211> 1246

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<222> (1) ... (1246)

<223> n = a,t,c or g

<400> 203

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gatctgatca	cagcagcatt	gcttttttgt	ctaggagatt	ctccaggagg	gaggggtata	180
tctgatagcc	gcatggctga	tatttatcac	attgacgttg	ggactcagac	tttttcactt	240
ccatctgcaa	tattagctac	aagtacaatg	gttggggaga	tagcttcagc	ttcagcttgt	300
gatcatgcca	atccacagct	ttcaaatacca	agtccgtttc	agacacttgg	gctggattta	360
gtattggaat	gtgtcgctag	gtaccaaccc	aagcagcggt	caatgtttac	ctttgtgtgt	420
ggacagttat	ttagaaggaa	agaattttct	tcccacttta	agaatgtgca	tgggtgacatt	480
catgctggac	tcaatggctg	gatggaacag	aggtgccctt	tagcttacta	tggttgtacc	540
tattctcagc	gtagattttg	tccatcaata	caaggagcaa	agattataca	tgnccgccaa	600
ttgaggtcat	ttggagttca	gccatgtgta	tctacagtat	tagtggagcc	tgctagaaac	660
tgtgtgttgg	gattacataa	tgaccatcta	agtagtcttc	cttttgaggt	cctgcagcat	720
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tactgcattt	tgttctgtta	atgaatggaa	atttgctgac	atcctaagca	tggcagacca	960
cttgaagaaa	tgagtttaca	atgttgttga	gaaacgggag	gaagcaatcc	ctttgcatg	1020
tatgtgtgtg	acacgagaa	tcactaaaga	aggacgttca	ctacgctcag	ttttaaaacc	1080
tgtactttta	aagttgtaat	attactagca	cataatgca	agcacctagt	ataattcctt	1140
tgtaatatgt	gaaactttat	taatgtatta	aatattacaa	ctagctaaat	ttattgtcac	1200
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<210> 204

<211> 1153

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<222> (1) ... (1153)

<223> n = a,t,c or g

<400> 204

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acctgggagg tggagggtgc ggtgagctga gatcacgcca ctgcactcca gcctgggtga 180
catggcaaga ctctgtctcc aaaaaaagta atgggatact ttagttgata acttttttaa 240
aagaattgct ttgctaaaag ggttcatttt atgtacagaa attgtatgtt ttaagtctga 300
tgaattttaa ttatacttca cacctactag aagcaagtca caagtcagta tataattata 360
ttttgctttg tttgcagagt acgttagtat atatccaagt actttatagt agattgataa 420
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gagtttttac tccagactgg tttagggcag gtctttctga tttaaaaaca gtgtccagga 660
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gctaggctgg tctcgaactc ctgacctcag tgatccacc acctcgcctn ccaaagtgtg 1140
ggatacaggc tgc 1153

```

<210> 205

<211> 657

<212> DNA

<213> Homo sapiens

<400> 205

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gaaatgcctc tactgcatgg tcaccttttt ctccaagaaa gaaaagattt ctctctagct 60
ttaataagca gagctttgca tactaaataa cttggatttt cccatcatcc caacattcaa 120
accaagcctc agaggaggaa aaatgcttca gagaggctgc aatgactggg ttttgccatg 180
tgtttctgag aatcagaaaag gcactgcaga tcttctagtc ttctggagtc ctgtggctc 240
tgctgagcac tgccactggg gccctgattc aaggcccaag cttgggaaac attgtttctg 300
gagctgctaa accacaacct agaaaggagc acaaggaggt gatgaagggc atcctctttt 360
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ttaattgccc ccaaccttgg ggggaagggg ggccatttgg gggaaaaatt aaaaatgggg 480
gggttttttc tggaagggaa tttttcccca ccatggaaaa gaaaaaattt cccccaaggg 540
ccaaaaccaa aattaacctt cccagaaaaa tgggggcccc aaggaggccc accccaaaat 600
ggccccaccg gcagggtccc tttaatagaa gcccaaaaaa gggcaaaaga tatccgg 657

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<210> 206

<211> 365

<212> DNA

<213> Homo sapiens

<400> 206

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aaagtgtctg gggcggtctg tgacctgtg gctgggttct tcatcaacag gagccagagg 60
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tacttcttcc tgtggttctt gcccccttc accagcctgc gaggcctctg gtacacgact 180
ttctactgcc tgttccaggc cctggccacg gtgcctaca cagcgtcac catgctgctg 240
actcctgcc caaggagcg ggactcggcc accgcctacc ggatgactgt ggagatggcg 300
ggaacactga tgggggccac tgtccacggg ctcatcgtgt cgggcgccca cagacccac 360
aggcc 365

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<210> 207

<211> 649
 <212> DNA
 <213> Homo sapiens

<400> 207
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 ttcatacctgt agaccgatag gtatggaggg gaagtattat tggagagacc tcaggggtttt 120
 ctcacctgag aaggagagaga gccctggggg ggtcagagct gggccctgag tgggtgggatt 180
 tagaaagaag ggaagagggg agggccttgga agataggaga aacagcatga acagcagcag 240
 ggggaatggg tgagtgtcct cctgaaagga ctgtggagat ggccgtggag cctcttcttg 300
 cccacttctc gagatgggtca tggccttagtg ctagagactt ttattccttg ggcaatgtag 360
 acccagctct atgggttccc tgttttttcc ttctcttcc cctcattata acagataata 420
 ataatgattc ctagctttca gggaacacat cttgtatacc atgttctgtg tgcctttacat 480
 ggattgtctc attacagctt cacaacaacc tttagagatag atgttctgta tcattatgtg 540
 caccttacag ttggtgcagc tgaggcgtag agagggtaaa taacttgccc ttggtgggtg 600
 acatagcaag gcaggagttg ggtgaggagt ctaccagggc agcctgaaa 649

<210> 208
 <211> 369
 <212> DNA
 <213> Homo sapiens

<400> 208
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 agtccagctg ccagcctcgc cagaatcccc ttattatttg aaatttattg ttgtattcac 120
 tcaatgtatt ctgtgcctga aatgcatctc tggagtcaac atgggtaccc ttctcttctt 180
 taaagccctt ccctgatgtg cagtgttacc tgtggtgtcc tcttcgctct ctcaggcctc 240
 ctgttatact cttctccttc cccacactgg aacagaccca gtagaattgc agtgtatctc 300
 atgtgcctca ctaagtactg cactgggagc tctgcgcct cctgccagtg actctgcttc 360
 agccatgtt 369

<210> 209
 <211> 631
 <212> DNA
 <213> Homo sapiens

<400> 209
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 cctaacttgt tcggtcctgg actaactatg tgggatgcca caggtcaggc agtctttgaa 120
 gtaacottat gaagtaggaa ttatatcgat tttatataag agaaaactga agccaacgag 180
 gtaaaataac tcgtcccaag taatgaagct tgccataggc ccagccaggc ttagtcaagc 240
 cctggctcct ctgatttcaa agcccttgct gcttctctgt attgcacact ggttctctct 300
 gttgcacact gagcaacatt gtctttttta aatctattat gaaataaagt taaacagctt 360
 cataattatc attgtcatta tttttctttt tagctactat tttttggtct gtccgtgtgga 420
 aacagcttgc aatcctcaca agaacctcgt aatgtgaata tgccagcgtg ttgctacaga 480
 ccgtgcttac ttcagccaat ttctctgctg aatatcctcc ttttactgat gaggaaccca 540
 agtcaagaag tcataaatga cacacccaag gctgggaagt ggttgagcag gtatttagac 600
 tcagggtctat tttactcctg tgccctgtggg c 631

<210> 210
 <211> 818
 <212> DNA
 <213> Homo sapiens

<400> 210
gcaacctggg tggatttaag gtggagggtct tcctctctcc aggtgggtgc cctcatctct 60
acccccaccc caatcccacg cattctcctg ccctcctgct ttgggcaaga ccggggcgat 120
gtggagttgg catgtccagt tgcagggtatc agcaccactg caccatctcc tctgccttca 180
cttcccacca gcacacagaa tttatatgcc cttcccaagt ccaaaaaggg cccctgccat 240
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gttctctttc caccatcaga gagtagcggt caacatcatt tatacaagac aggcttttgc 360
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tgtcaagttt cgtggaagtg gaacctgaag gaagggttagg tggagactgc agagagggtt 480
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ttcattcatg gagtgacctg ccttggtcat ccttttatct tccagtcaga ggggtcatca 600
gtcaagagct ggccaggctg ggtgtggggg ctcatgtctg taatcctagc actttgggag 660
ggcaaggcgg ttggatcatc tgagggtcagg agttcgagac cagcctgacc aatctgggtg 720
aaccctgtct ctattaaaaa taaaaaatc agctgggggt gatggcgggc acctgtaatc 780
ccagctactt gggatgctga gacaagagaa ttgctttg 818

<210> 211
<211> 387
<212> DNA
<213> Homo sapiens

<400> 211
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tgtcagcatt taaccgcctc acacagaatg cagggtatctg gcccagggcc acagctgttc 120
ctgccctctg tgttctttgt gctgttattc tcatatactt tcacagaaac cacacaatgg 180
actgtttgtg ttttggtttt aaacagtaag ttatctttta aagagattga aacaattttt 240
tagtctttta gtctttttat ctccctctca ccattttctg tgggcttcat tcctttgtgg 300
ggacctgagt ttccaccggg catcatcttt ctctgtgtg aataacttcc ttttagcagtt 360
gttatagaac agatgtcgac gcggccg 387

<210> 212
<211> 400
<212> DNA
<213> Homo sapiens

<400> 212
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ctaagcttta ttgagcaatg tttatgccag gaactgtgct aaggatttta ctagcattac 120
cttattttaat ctttacaag cagggtacaat tttttctatt ttctgatgaa attatggcat 180
ggaaagtggg ggcaccgggg cttgaactca gtgctgtgac tccagactcc aactcttta 240
accattacac tatactatcc tgacattaat attctatatg attaagcttg cggagaagta 300
aattgagggt tgatatgact ttacaccgtt ttaatcaata ctgtgggttt atggaaaggc 360
acagtgttat caagggtgat aatattgggg aggttatgga 400

<210> 213
<211> 567
<212> DNA
<213> Homo sapiens

<400> 213
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tttaaaaaac aagataaccc aaacatagct gttttggctg ccgtcatctt agcacacaaa 120
attttgaaaa cattttaatt catgcaagtc aagttcattc ttaaataatta catttcattc 180
ctctggaaaa ctgtaacagc caatggagaa acagtaaaca tgtctcttct ctacattttc 240
actactatgg aaatgagaaa gaaaagtga gtaggactgc acttaccat ttccattctc 300

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aaacccttct ttacaatagt gctagatgaa aagattgtta caggccaggt gtgggggtggg 360
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tgctaaactg aatgagcctt ttaagaagc tgcctctgc tctaaaactt aatttacaag 480
gtatcatgac atattcattt ctgagaaatg cagtaacacg cagcagaagg aaccagttaa 540
atctcttcta tcatgtcgac gcggccg 567

```

```

<210> 214
<211> 806
<212> DNA
<213> Homo sapiens

```

```

<400> 214
cccgttctga cgatttcgtc ctacgcacca tctttatgtg gggctcccta gaaacccttc 60
tcttttattt gccacttcct gttttgtgga cactccatgc ctgagctgcc aacgtgggtg 120
ctggcattac tgcctcatcc tgtgggtttg ctcatgtact ctggagaact agaggccttt 180
gagcagatat gcagaagcac cttgaaggca gtgtggcact cagtacatgg tgccatgtct 240
gtgtgcttca tctgcttcac cttttgccat taaagcagtt tccaggggac tgtattccag 300
catagtgttg ttttaaaatc ttcttagtta aggtgatttt tacaacctct ttgctttcct 360
tcattgtcca gcaagtcttt accatgagaa atatcttatt gcagtctagc ccaaagtgtg 420
tacttttatt tattcttgtt tcttttaaca tgccatagaa gagtttaaag ctgtctgtta 480
ggagatagaa ttggggccgg gcgcagtggc tcacgcctgt aatcccagca cttaggggcg 540
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acccttctc tactgaaagt acaaaaatta gccgggcatg gtggcgggcg cctgtggtcc 660
cggctcttcg ggaggcctga ggcaggagaa atgcttgaac ccgggagtcg gcagggttgc 720
gtcagctgag gttgcgccac tgcactgtag cctgggcaac agagtgagac tccatctctg 780
gagacacaca cacacacacc tgtatt 806

```

```

<210> 215
<211> 459
<212> DNA
<213> Homo sapiens

```

```

<220>
<221> misc_feature
<222> (1) ... (459)
<223> n = a,t,c or g

```

```

<400> 215
cctgaattcc tcgactttcc cttttgggct cacatgagaa ttgttaggag aatgtgcatg 60
tggagtgcgg gcccagcacc tgctaccgtc tgcgctgtaa tggtggtgc tcctaagagt 120
cctcagtcct ctcctcggtg ggcttgtgtg tacagcotta tcggttgtca ttcttcggat 180
ccattctcag tttatttttc tgggtattagc tggagggaca tctccttaag cctgtactct 240
atggctcagg agtctcaaaa ccagtccatt ttgaagttag agtatcccta ataaaaaggt 300
gagtgtcccc actcctgtgc cttgtttttt ttgtttgnnn nnnnnnnnga aacggagtct 360
cgttttgtcg cccatgccgg aagtgcggaa ggcagtggta aaggagggtg gcggcagcgg 420
ttagcggact caagtctaaa ccgggcgtcg acgcggccg 459

```

```

<210> 216
<211> 881
<212> DNA
<213> Homo sapiens

```

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<220>
<221> misc_feature
<222> (1) ... (881)
<223> n = a,t,c or g

```

<400> 216
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 cagttcaggt acctgcttag gccctatata atttcttgat gtgcccattg ctggtatata 180
 agatcatact tgtttttgct gccatgtttt tcttctcaca gggaagccaa gttgagatca 240
 gatcccatga ggggtgaacac tgtgtgggaa cagtacatct tcttagtcat tttctgtatt 300
 ctaaaaataa cccagtattc tataagggaa ataccagttt tatatttgaa acaatggagg 360
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 ggaggctgag gcaggagggg tgcttgagtc caggagtttg agaccagcct ggcaacataa 480
 ggagactgtt gctatggatt accaaaaaaa aaaggtaaaa attaaaaact ttaaaaaaag 540
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 taacaaaattt aaaaaattgg cccaattagg cctttgaaat tatttttgga aagaagaaaa 660
 tgtccggcgc cggccggcga atttcagaa actatggaat tggttaaggta cttggaaaaa 720
 cccccggcaa ggtccacett acaacttggg ccacggggg caccaaaatt aaaatttctt 780
 ttcaatttaa accatgcggg gttgcccttt ccttttaatg caacctataa cctcccccta 840
 aaagggtcaaa atctttgggc caagggaaac cctcttggat a 881

<210> 217
 <211> 700
 <212> DNA
 <213> Homo sapiens

<400> 217
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 gtgagctatg cagctaacca gggaaagagtt ccaggtagtg gggatagcaa gtgcaaaggc 120
 actgaggaaa gggcacatgg gagggggcag caagaaggcc actgtagcca gagcagttag 180
 tgagggaaaa ggagaaataa tttcagagat agcagtgat cagcatgtat aggggtattaa 240
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 cttaagctgc ttaagcttga aacgtgctgt gttcttttac 700

<210> 218
 <211> 792
 <212> DNA
 <213> Homo sapiens

<400> 218
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 ggctgttgcc tgtttctagt gaggacttct gctgcccttt ctgttttgag ttccattct 180
 gcaaaccccc cctcacatgc ggccctgcc gttccctacc aaatatctag gtaagttcag 240
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 aacaagaagc atgcacacac acatttcagt ttcttttaaa ggaaaaataa gaccacatc 420
 tgcttatctg cttctttttc ttttttctt ttgttatgga gtctcgcttt gttgccagg 480
 ctggagtga gttggtggcg gatctcggca cttggcaagc tccgcctccc ggggttcacgc 540
 cattctcctg cctcagaatc cggagtagct gggactacag gcgcccgcc caacgctcgg 600
 ataatttttt gtatttttag tagagacggg gtttcaccgt gtttagccagg atggtctcga 660
 tctctgacc tcatgatcgc ccgcctcggc ctcccaagt gccaggatta caggcgtgag 720
 ccaccgtgcc cagccactta actgtttttt aaacaaacat gaacttaaaa ttatatcaaa 780
 cagaccatgt at 792

<210> 219
 <211> 375
 <212> DNA
 <213> Homo sapiens

<400> 219
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 tattcttagg atttccgtct ctctgctgac attgcccatc tcttcttaca tgctgtctac 120
 tttatccatt ggaactctta gcatgctaata catagtgtgt toggattcct ggtcttacag 180
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 taatggcata aataggtcct taggaattta ctggtaaaagt gtaggaggag aggcagtgtt 360
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<210> 220
 <211> 1128
 <212> DNA
 <213> Homo sapiens

<400> 220
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 gacaccaga cgctggcagg cctcccccaa ttaccatgcy ctccatctcc ccaaaggcgc 120
 cctgtctgca tttctccacg gatcatacgc ctgtcggccc ttgtgcctgg ctccacgcta 180
 tatcacttct gagagtcatt cgtgttgctt gtagcagtgg gctgttcttt ttatgctgtg 240
 caagtgtcaa ccgtaggaac ctgccaccat ttatgcccat gctctggggc tgctcccgcg 300
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 cacacctgga tcccccgaa ctccctgogg aagtacctgt tgctgcctcc tgagagtctt 480
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 tggccattgc agacaccact tgccctgccc ctcttggtta caggctcttc ccccatgccc 720
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 gctggggcgg ccagaggaga caaggccaag ggtgcaccga ggaggcatgg tgctaacttt 840
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 tgatgggcgc ttaaaaacaa ttaagcggg gggagcacc tcttgggccc aactaatccg 1020
 cgcgggacac ccccgcgac acgacggccc atacgttccc cgcctccgcg ctgctgcgcg 1080
 gggcgccac tgcgcgttc gccccggccc cgcgccgcac gggcgggc 1128

<210> 221
 <211> 650
 <212> DNA
 <213> Homo sapiens

<400> 221
 cttatttacc ctgtgcctat catgtagcaa gcacttcata aatgttagct attattactg 60
 ccaaataatt ttaactttac ttgggtcaac ttcttcacag aatgatataa aggagtatct 120
 aacattctcc atccagttca aacctgatt ctgttagcc ttttgatctt gatagtagag 180
 cccctgtttg cctctctgac tcctctgagt ctctgttttg agtgtgtgtt atttctaaat 240
 gtaggccaac atcttaactga ccaaactttc tctttaaat ggctgttgtt ttaagcaat 300
 agttgattg gaggggtggg tgtgagttgt ggaatactta aaagccaggg ctctggactt 360
 gagaaaggcc tgagtttgaa aacttgactt gcttttctact atttgatcaa aggcaggtta 420
 ttctctctcc agtgttttcc tctgaaaaat ggggaatagta atatcttcat agggttgctg 480

tcagaattaa	gtgaagtaat	gcatgtgaaa	tgtttgacat	gatactgaca	cttcacaagg	540
gttaaataga	tattagctgc	tgttgggtta	taacattaat	atccatgggtg	gctgagactg	600
tggcaatgtt	attcattgtg	tattttctagt	gtagagcaag	tgatcagtaa		650

<210> 222
 <211> 655
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <222> (1)...(655)
 <223> n = a,t,c or g

<400> 222						
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ttcccaaccc	caaattgggt	agtaactcat	ggagaacaaa	atgccagtag	tacagatata	120
gaacatgggt	taaaaactat	tctgatcaaa	ccccagcaa	gaatcttgaa	gaggaagaca	180
gagggggaag	aaagcaatag	gcttactctc	cctacaactt	aattccatgc	tctaattcag	240
agcagtataa	ttaaccccca	gtttcactgc	taacactgaa	gtttttcagc	ctgatgagaa	300
tatcatttag	tatcctgcaa	tcgccaataa	tagcaatatg	acacaatggt	gcccattgag	360
gctctaatac	gagcacatag	tcattttacat	agaacatttt	ctgtgactct	ctgtaataca	420
acgccacaaa	gactcaattg	agacacaagt	ctccctttcc	cataaactan	nnaaaaaaaa	480
aaaccagaa	aaatgggttg	gggggggggaa	aaaggaaaag	aaggaccccc	cttttttttt	540
tcaaggagaa	ccaaattgtt	ccccaccatt	attccggggg	gtttacaggc	ccgggggttt	600
tctttaaaaa	aggttatttc	cggtgccctga	aaaaaaaaatt	aaaccttgct	ctttt	655

<210> 223
 <211> 665
 <212> DNA
 <213> Homo sapiens

<400> 223						
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ctgggcacag	gatgggtgat	ggtctgtcct	cacttgggcc	ctggtgcca	tgacccacct	120
gtcccagctg	tgtgtgtcag	tgcgtotgcc	tctctgccag	atggttgagt	ctcccagtat	180
gcccactgac	tatctttcag	aattccacag	gggcagatgc	tcttaatgcc	ccacctgagt	240
cccttgga	tttcttttct	gtttcaggac	acatgggcc	tgtgtctggc	tgctggcaca	300
tgagcctctg	cttgagggtt	tatttggcac	tggaccctgc	tcaccaggaa	ttgatgcctc	360
ctgggagtag	cctccaacca	attactctag	gaattggcat	tgagatcctc	cagcctccta	420
cccttgaagt	gggcaactct	gaggcactct	cggtgccgtc	tcgcagaact	cccaggagga	480
ctgagctccc	gtggcccacg	gtgctaactg	gctttctaata	aaacacttta	tgagccttct	540
tcccttcctt	gtctcacttc	cctctccctc	ctcccatat	cagtgcctcc	tggggtcaca	600
tctcaataa	gattggatcc	ttggctcaag	gtttgcttct	tagggaacct	aaaccgacgt	660
gtatt						665

<210> 224
 <211> 567
 <212> DNA
 <213> Homo sapiens

<400> 224						
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agaatgacat	gcctgttcat	gattctagaa	ttcagggttg	ttaaatatga	cagtaacctc	120
tgcagtcagt	tgatcattaa	tcaccacaaa	gttcaggggac	gccaaagatg	atccagaggt	180

aggcatctg	ctatttcaac	ttcacgagc	caaaatggaa	gttaaagagc	taatctggc	240
tgaacagaag	attctggcag	aacactgaca	ctgaatccaa	ccttcacgca	tcctctctcc	300
acatcattct	ttaggcctta	actctttatt	ccacattctc	taataaacct	ctgtagctct	360
tcccacccac	agagacagca	tcctgagagc	tctggggaac	actcagatgt	cctaaccaca	420
tgttaacctt	gaattcccca	gttccagtgg	ttttcacctc	tgctccacat	gagataacct	480
tttcaaagag	ccatgcccg	gatcttgtca	tcagctgcac	cacgctgcct	agaaactgtg	540
agcttggacc	attcactttg	tggtctt				567

<210> 225
 <211> 1212
 <212> DNA
 <213> Homo sapiens

 <220>
 <221> misc_feature
 <222> (1)...(1212)
 <223> n = a,t,c or g

<400> 225						
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agctcctgat	gagtgcgtgg	tgtagctatc	tgcttcatgt	ggggcgctcc	tgctctgcag	120
tgtatagtat	tttttaggtg	gactaggagc	aaatgcctgc	ctgatacagg	caacgtttgc	180
acaaaaaccc	aaaggaagaa	ggctgctggg	aggctagggg	tggcaggtgg	gattgccctt	240
gggctttaaa	gaaggctgag	aaaacttact	tcagagtggt	gaggcaggag	gagtgcacct	300
tggaacaata	gtggagtgtt	tgtggtggac	ggacgggaga	gaggaacact	tgagggcatg	360
aacttacttc	tgtctcttta	cttgaaaaag	caatccactg	agctaagacc	ctaaaatata	420
tcaaacccaga	gggttccctt	tcgagttttt	agttttttaga	tcattcggta	tcctcaatgc	480
aaagatgtga	taaagtcaag	ctcaggacta	cttggggacc	aattctcatc	ctcctcatgt	540
gttacaattc	cttagcagtt	gctttaaaac	taacattttt	ctaactctga	aataattaat	600
aaagcagctt	tctgctaaag	agctgaaagc	atntacgaa	ccttatcttg	aggatatccg	660
cgcataattt	attattttta	gtcatttttt	ttagcctaca	gaatttcatc	aacttctttc	720
cttcagggtac	acggaaagca	acctcccttc	cccattttat	agaagaataa	acaaatcttc	780
ataatgttta	cataattttac	ccaagtcact	tgggagaatc	tggaatcaaa	cgcagggtctg	840
ctggttccaa	aaccttctcc	cctgtggcat	taggtatatc	acatggactc	ttaagtaagc	900
ctcaaaaatct	acaaaagtgc	agtgatctgc	ccagactggc	cagccacaat	gtcagggggg	960
aagggtggga	taaccacat	gcccgagac	aatggcggag	acaaacaggg	atcttctctc	1020
ttctgagtc	aaaacaaaac	ttggggtctc	cctggggggc	accacagcg	gcccaccct	1080
ttctgttttc	accagcatgg	gcggaagtgg	cagcttcttg	ttctcgtggc	gggagcggac	1140
acagagcgta	ccgacactat	ctttttctaa	caacgggtct	tttgtggcgc	gagcggcggc	1200
caacgaagcc	ct					1212

<210> 226
 <211> 688
 <212> DNA
 <213> Homo sapiens

<400> 226						
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gctttgtctt	ccccttctcc	cctcctagtc	cttcttttagt	cattctattt	agaatcaagt	120
cgctcatgag	tttaagaatt	agagcagcaa	gaaattgggc	tagagatgta	caaaagcttt	180
ggacaatagt	agttttgctt	gtcctcattc	ttattagaag	tgctgttaat	ttactgataa	240
attctaggac	ggaagacaaa	tctttgcaac	tggtagctata	tcagtcggta	attatttggt	300
ttccttagac	catattgagc	tcccgaagta	cagaacaatg	agtagatgtg	aaccaagatg	360
ctgggatttt	ttaagtttca	aatatgtgtg	tgtatatata	agagacagaa	tcttgctctg	420
ttgtccaggc	aggagtgcag	tggtatgac	atagctccct	gcagccttga	actttcaggc	480
tcaagagatc	ctcctgcctt	agcctttcaa	gtagctaggc	ttacaggcat	gtgccccacc	540
tggtcttttt	tttttttctt	cttgtagaga	caaggtttcc	ctgtgttgcc	caggctagtc	600
tcaaaactct	ggccactagt	gatcctcctg	cgttggcctc	ctgagatgct	gggattacag	660

tgtgagccac cactcccagg cttgtatt

688

<210> 227
 <211> 344
 <212> DNA
 <213> Homo sapiens

<400> 227
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 tttgtctggc ttctgcagct cttcagcttc atctcttgcc actctgtcat ctctgtgtcc 120
 ccagtgcatt tcccatggac acagtgtgca gtcatacccc catacaccag ctgtccctaaa 180
 ctatttgcaa tacaggagg aagggttctag atagccagat ggcttcattc cgtagctttg 240
 ttccctccct ctgtttggga tctcttgac aagcacagaa ccatctttct aggtccatt 300
 aaagcatacc ttttctgaaa gacccttcct ggtcgacgcg gccg 344

<210> 228
 <211> 1211
 <212> DNA
 <213> Homo sapiens

<400> 228
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 tagagaatga gggtttcaat gagctgagca gaggaagttg gttttataga caggggctga 120
 ggaaagcaga aacagaaaac aaaaaatggg tggtttcaaa gttaatttat ttgtaaagg 180
 taaagcagag ggaagtccct tatgctggct aaaactggca tgtttggggg cttggctatt 240
 atctcttcta atttctcaga agtcagatga acaactttgc tttggcttgc tgacatggaa 300
 ctttagcaca agtgactcca ttttggtttg gtttggtggg cctagggcag ggactcagtc 360
 caaaccagtg gtctcctata aattttaaca gatctattag tacttgaaaag aaatgtcaaa 420
 tttcatttag aagttaacaa aaatgaagat gtagctgttc agacccttta aattcatcca 480
 tgttcacaga cctctaaag tctatccatg gaccccaggc taagaactgc tggcttaggt 540
 ggagcagcca gggaactgc atcccccg ataggggac gttaaaggcat tagaggagg 600
 aggcacttgc cttgcagtgg ggcaactcca aaaaaggcaa agatatctcc cctaagtgtg 660
 aaattttaaa aaatcaata gctaacaaat gaagctggaa aaaccacttg agacaatggg 720
 aaaatattaa tgctgaaacg tattagatgt taaagaatta ttgagttttt tcccttaag 780
 aatgtgggta acataaaacg cctttaaact gtatgaagaa gtttccttga caagccttgg 840
 attaactctt aacagattgg gggacgagga aagtcggcaa atccagatga ataacaattg 900
 cttgtttggg gccgtctaat agatccaact tacgaccgc gcacccaat ttatagtttt 960
 tgttcgggcg cgtacagtca ctcccgggc gcatttacac acccctcagc gggaactcgc 1020
 tggctcttcc tcataacaga cctccaccct gatactgcga tgcgtggtgc ctccggtgac 1080
 ttcttgcgcg aaatacgtct acctccagc tgcgcccgt acgcccagc ccgcccact 1140
 cctggcgcat cgcattggct tcagctcccg ccgtgtgcgt cgccgcgtgt gcgcccggta 1200
 ccatagaacc g 1211

<210> 229
 <211> 653
 <212> DNA
 <213> Homo sapiens

<400> 229
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 ctacattcag taatgaatat aacatactaa gagggtgtt gaaaatgtca tggaaacttc 120
 ctctgtttt acaaacccac tottagtatg ttttcttgc ttactacatt cagtaatgaa 180
 tataacatat actcctccaa aaaagaaaa cgaaaattgc tccaaacccc tgatcctgac 240
 cagttcccta gggactgtac aataagttag aagcagcatt aacactacca ccggcaatta 300
 aaaaacaaaa taaccacaaa taacgaaatc agaaaatgct gcagtaatga cagtggccta 360

cgagagcgag	cgagcagget	gaggggttaca	tacctcctgg	agtttggggc	aaggaaaagg	420
agagccaaaa	tcatggaaac	atacaaatga	gggagaaaaag	aaaattaaaa	caaagaaatt	480
aaacccgatt	ccttaatctt	aaagtgcaat	gtatcagtc	cattcatgcc	tgccctgggga	540
gagagctgaa	ctaaaaacac	tcaacgggca	aatgatccca	ctactgtctg	gcacgtgaac	600
gacgggctct	tacatgccac	gttccacctc	atcaaggcaa	gattgtcgac	gcc	653

<210> 230
 <211> 1033
 <212> DNA
 <213> Homo sapiens

<400> 230						
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atagggtagt	gtcctcaagg	aagtctcctc	ttccaggaaa	ggaccagtg	ccactgaggg	120
accttcttca	ggacatgccc	cagggtcagtt	gttggattag	gcaggccttg	ggcgagtgag	180
gcttaatatg	gcttgggact	tgagtttttc	ttgctttccc	agaattcatg	agcttttgtc	240
atttagaatg	tttcttactc	ttctgtagtt	gtcctcactg	gcaaatccca	ccagatattc	300
ttcagtgagt	atgcttcctg	agtgaaatat	aaaggtgaag	gaacattggg	cagagcagta	360
tttaactacc	atggccacat	ttttgttaat	tattttggta	tttattcctt	gtgtgggtgt	420
gtaatttttg	gtaaagttgc	attaaaatag	tatagcatgt	gcgcattttt	acttcccttt	480
aaacttcttt	tcttcttgga	aatctctttg	gctatgaaat	ctcattttcc	tttcaccctt	540
ctgattctta	gccgagtttt	acttaagaaa	acgttgtagt	tcttgaaatt	aggttggtta	600
attacaattc	cttcgaatga	tttgacttct	gtattcaccc	tgatgataca	tagacaaaat	660
caaaagcatt	tttgacaaag	taatgctttc	tcacatattt	agcttcttta	tagacactta	720
cccattcttg	taaaacccaa	aactagtgt	tttacgttgt	aaaaagcgtt	tttcaaagca	780
tgtggggcct	gtaggatgta	cacgacagtg	ggaaaagcct	atcccttttt	tgaagggaga	840
atcaagcgct	cggggagcga	atttggaaat	ggagatgggc	acctccaggc	gactctttct	900
ctgaacacca	cgtcgcctga	catcccggga	ctagagagag	ggctactttg	ctcttggtga	960
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gctaccttat	gcg					1033

<210> 231
 <211> 401
 <212> DNA
 <213> Homo sapiens

<400> 231						
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cgagactctg	tcctgaatac	ttttctctgt	gagatagatg	tgcttagtat	tttcacttgg	120
cagatgagga	ccttgagaaa	caaaggggtat	ggaactttcc	aggcccccac	aatgtgtaaa	180
gcacaagtgc	aggattcaag	ctgcagagtc	tgagtcccaa	aggaaagcat	ccaggacatt	240
acctggagca	gagtgggcat	ggagtaagtg	acagtggtga	gttttggtta	ttctgtctcc	300
acatttaacc	aggcttcgct	gtagcctaaa	catcccacct	tcttggtgat	ttcatacaca	360
cattcacctc	ttgttgaaaa	gaaagcgtga	gaacctaaag	a		401

<210> 232
 <211> 206
 <212> DNA
 <213> Homo sapiens

<400> 232						
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cctgtgctcc	cttaacagct	ctttccagtg	gctgcctctt	ccagtccatc	ctcataccac	120
catcagatat	aggtcctaca	acatgggttc	agtcaagctc	acaaatgttc	agtgcatttt	180
agtgcacacat	gctgtcgacg	cggccg				206

<210> 233
 <211> 649
 <212> DNA
 <213> Homo sapiens

<400> 233
 aaacattctt tccctgggaa gtttttttatt gatccttggt tgaagttgat acataatatt 60
 atatcataac tgtgtgatgc tgtttctgca tatagctgaa tgcagctttt tgagactaaa 120
 gggtgcattt ccttcattct tgaatttcca gcccctagca cagttcctgg cacatatatt 180
 ggagggtatt tataaatgcc ttgggaaaaa aggagttcaa gtgtttaatt tcctggcaaa 240
 ctaaatagct ataaagagag agcttagaaa gtctagagta agagatgatt agcatgcttc 300
 ctagaccatc tgtcactaat accaattggt tctacttggc actgcagact tgttttttga 360
 gggggagggc acgcttggtt aaagttaaaa aaaacagAAC aaaaccaaT accagaactc 420
 ttaggttatt ctataccctt ctgttttagtg gctaaaaagt cattgctgat ttctaaaaaa 480
 catggacatt cttattcagg agagatagat gccattattg ctttttccaa gagcaataca 540
 gttgctataa ctgagagctg gttctgcctt gcccccttac aatctattct tgatgcgga 600
 accccgagtg atcccattca aagggtgcaag ggcaagaaat atgtttctc 649

<210> 234
 <211> 388
 <212> DNA
 <213> Homo sapiens

<400> 234
 atcctcgact atttatccgt ctacaagatt atccttggca tactcatgta ccacaacgta 60
 agcacaggcc tctaaatat cagacatcag tcgcaaaaca gtctcatagg ttctacgtgc 120
 acatgtctag taaatgcgtc tatggatatg agtatccagt tagtcacata taggacttaa 180
 attcagtaaa tgcaaggcta gactcattac ttaccagca ttcgcttgta taagtatctc 240
 aaaaggaagg aggtgcagat actcaagcag aatcagactc ctcaaatatg ggacatagag 300
 gacatacatg aagatacagg ttatgagaca gaggacatac cattcagctg tcctatgtaa 360
 gatggcatca gtatctaaag gcatgggt 388

<210> 235
 <211> 313
 <212> DNA
 <213> Homo sapiens

<400> 235
 tacagagaga gcctcggctt tgcctcatct ctaaagttgg aattgtagca gtgatactta 60
 cctcataaag ctgttgagaa gactaaatta tttaatcaac atataaccct tatcaccata 120
 tatgataggt tttataatat tccccagtga gataatggcg acaagaagta agggggcatt 180
 tattaattgc tatattatat tactgctgac gtttcttatg atcagaactt tttacaatct 240
 catggaatat tattgtccca cttactaat aaggaaactg atgtctaata ccaagatact 300
 ttgatttgca cat 313

<210> 236
 <211> 567
 <212> DNA
 <213> Homo sapiens

<400> 236

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agaatgacat	gcctgttcat	gattctagaa	ttcagggtgt	ttaaataatga	cagtaaccta	120
tgcaagtcatg	tgatcattaa	tcacccacaa	gttcaggggac	gccaaagatg	atccagaggt	180
aggcatctgg	ctattttcaac	ttcacgaggc	caaaatggaa	gttaaagagc	taatctgggc	240
tgaacagaag	attctggcag	aacactgaca	ctgaatccaa	ccttcacgca	tcctctctcc	300
acatcattct	ttaggcctta	actctttatt	ccacattctc	taataaacct	ctgtagctct	360
tcccacccac	agagacagca	tcctgagagc	tctggggaac	actcagatgt	cctaaccaca	420
tgtaacctt	gaattcccca	gttccagtgg	ttttcacctc	tgctccacat	gagataaccc	480
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agcttggacc	attcactttg	tggcttt				567

<210> 237
 <211> 623
 <212> DNA
 <213> Homo sapiens

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agtattcaat	atgagcttcc	agcctgaagt	tttatttaat	ttcagggttat	aaccttaaat	120
aaacaatttt	cctagcctca	ttaatgctta	atctaattgtt	gcataacaaa	gtatggactt	180
ccttagtcgg	ttgatgctac	tgagaatgtg	caaagtgtgc	acggccacat	accagtacat	240
tagaagatct	ctgttttttaa	accttgtccc	tctctacaa	acgttgtcta	tcctcactgc	300
tcacagtgtg	ctcctcaggc	cagcactctc	atcactgggt	aaaatggaag	attctcaggc	360
cctgtccttg	tctcttgagc	cagaatctgc	attttaacgg	acccccaga	ggattccaaa	420
gtactgtaaa	gtttagaaa	caccgctatt	tacagtaatg	cagacttgca	gaattctgag	480
cctgcatagt	atattcattct	taaaatgata	ctgtctttat	tctgttaaaa	ttgtaaaagt	540
tcactattag	ggcttgattt	tgtttttcta	attattgcaa	aatattttcaa	acagaaaagt	600
atcagggctt	atttccattg	tca				623

<210> 238
 <211> 506
 <212> DNA
 <213> Homo sapiens

aattcccggg	tcgacgattt	cgctccgactt	ggcctgaagg	aagtgcacatg	agcataagga	60
agtgggggtgc	gggtgggagcg	ggtcaagtga	cagaggaggg	ctgggaaata	ttaatgaata	120
gagtcgtgtg	agaatcagcc	aatgtgactt	gaagcaacag	gcaaccagaa	tcgtgatggg	180
tcagtatttc	ccccaggcct	atccagacca	ggtcttatcc	tcctagcaac	gcggccctct	240
cggctcttaa	ggcgtgactt	gccatggatg	ttctgccttt	ggaaccagtg	ggtgggtcaca	300
gcacagaggc	tgttggtttc	atggctgtca	catgcacaga	gacagccctg	tccactgagc	360
ctgttctgtg	gcagaaggaa	ccccctagcc	tggaccatct	ttgggtggaa	acaccagccc	420
ctcactgtctg	actgtcattt	tcagatgtga	agagaacaca	cagtgttgcc	gatgtgtttg	480
tattgcctgt	aaacaacgat	tgtatt				506

<210> 239
 <211> 385
 <212> DNA
 <213> Homo sapiens

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ccatgactac	tagtagtttg	gtgttaccgc	ctttattttg	gctaaagtgc	cagcgttttt	120
accaccatt	gtatctgcac	ccttacagca	tatgtcaaca	tgtagtatt	cttgtaaaaa	180
tagtttgagc	ctgggggtct	gaggtcccca	ctttgggaac	cattgaaata	ggtacttaga	240

tctacagtgt	atcatatctt	ttcatctaca	agattaaaaa	catgatttca	gttaattgtt	300
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tcttggtt	tgctgaagtt	tactt				385

<210> 240
 <211> 389
 <212> DNA
 <213> Homo sapiens

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gacccggggc	atcacctctg	atgottgcat	ggaggctttt	gtgcccattg	ggctcctgggc	180
tccctacaac	cacagcacga	tctggggaga	gaacggagag	aaggagagag	gtgcgcacag	240
ccagcccccg	taaaatcctc	ttcaaacgc	agccaccag	gggttctagc	acagacagat	300
gcccatgggg	caggcagtc	ctgcatggga	caggcacctg	ccatatgcc	aacagataac	360
aggacaactg	tttaccatc	cctggtatt				389

<210> 241
 <211> 804
 <212> DNA
 <213> Homo sapiens

<220>
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 <222> (1)...(804)
 <223> n = a,t,c or g

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aacgtgaaag	gaaatgtatc	tctgtgtacc	tttattttcc	ctccagggct	taaatggaaa	420
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aagttggagc	tctgagtgc	ttttcccaca	aaaaccatgt	tatatatagt	ggtttgggtc	540
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acaaaccac	aatcagaaca	caaccatct	gaaagctgag	ggccgcctac	ttcgagtag	720
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tcctgcgtgg	cgctccagca	gtac				804

<210> 242
 <211> 386
 <212> DNA
 <213> Homo sapiens

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agtccctggg	aaatctcatc	cacacacttg	gatttttgct	gataattcac	aaatatatgt	180
cagctttcaa	aaaccgcaca	gatgagttta	tgaatatggg	tatgcagccg	tatataaaat	240
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<210> 243
 <211> 279
 <212> DNA
 <213> Homo sapiens

<400> 243	
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ttatgggggt ggaggctcctg atgtacattg tggcggttaag atgccgtgct gtctttgcc	180
ccagcctgtg gcagccctgg tgttacacca gggcagggtg gcagtttaata gtatctcagg	240
ccagatgacc tgccctgccc acctggctga cgcggccgc	279

<210> 244
 <211> 340
 <212> DNA
 <213> Homo sapiens

<400> 244	
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cactagttct tataatgatg tttcttttagt catttggatt gcctcaagtt ttgcctctag	180
taaatctctt aggaaaggct taagggaata ttcatatttc atgaattttc ttgctcgttc	240
ataacatttt gtctgtgttt tttatatcta aagtttgtgt ttgccagaaa tagaatcctt	300
ggctcacttt ttcttttctt gaatatctta aatttgggaac	340

<210> 245
 <211> 380
 <212> DNA
 <213> Homo sapiens

<400> 245	
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acctcctctc cctgccttag tggtttgccc cattgggctc actcactgcc cttggccctc	180
cccttttggt ccagcctctc tggatgggtt ctacaacagt cgcagcctgg atggttaagtc	240
tccacccttg aggccagaga agtggctctc ctggctcctg ttctcacggc tcccaggtca	300
tgggcttccc aaggaggagg ggcagagaaa gagagaggtt tgggcctagc aggttaaaaa	360
gtccttctgt cgacgcggcg	380

<210> 246
 <211> 396
 <212> DNA
 <213> Homo sapiens

<400> 246	
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gattaatgta tccatctaac aaagtcccaa aataatggaa ggatgatgct gtggcaggtt	180
taccctggac catctgcggc ggtgctctgc ctctttctcc atccaccctg gtccaggtcc	240

acagcagtgg	agagagaaaa	gagacagaag	gatggccgtg	gtcagcgcat	gttgctgccg	300
cagccccagt	gcctgatgtc	tagttgttgc	ttggtagacg	tccagagttt	aacaggatag	360
attcttgata	ttctgcttga	atcaacaatc	ttacct			396

<210> 247
 <211> 363
 <212> DNA
 <213> Homo sapiens

<400> 247						
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tgtatttttt	tttcttactg	cgtaatatgt	agggtctaaa	gttttgaact	cttcacttca	180
gaaattactt	ttccagacaa	aagagcaaaa	caatgtttgt	ttaaattgtt	ctctggaaca	240
tgactgatag	tgttttacaac	atcttatga	cattttgatc	ctgtggggag	tacttggaaga	300
ggtattttaa	gtgcttttca	ctaaatcaga	tgctttgtag	tgtttgaacc	ttttttaaaa	360
aaa						363

<210> 248
 <211> 1120
 <212> DNA
 <213> Homo sapiens

<400> 248						
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gctgtcagtg	ttcagtgcct	taatgccatt	gtgtaatgga	tcagtaatga	accttaaggc	120
tctttctggg	tttgtgtgat	aaaccttttt	atggctacac	agattttctt	actgatgtag	180
caaagattgt	aactgttctc	attttgaaag	caaagatgcc	catacaacat	gggaaatact	240
gatattttgt	tgctgttgtc	gttgttttgc	ttcagttatg	agttggttgc	tggtaaaact	300
aaagcccagt	ttggggttcc	ctttgcagaa	ttttctgttt	tcttgatttt	ggaaaatgtt	360
actgcttgtc	gttttctgta	tatttaactg	gagctgggga	ataattgggtg	tttggcaatc	420
tctgtatcat	tcattgtagg	caaagctgct	actgtcaccc	acagatacat	ttgtttgcat	480
tccattgcaa	ggattgaagt	cagcacattc	ttagtcccaa	attgcttttg	gatattaatg	540
tttatcactt	ctataaccat	aaggagaatc	aaaaggctat	tggaanaagt	caaagcttgt	600
tatgcgcctt	acatattggg	tccgagaacc	cattaaaatg	cccagagtc	aaaataccct	660
ccagaagttg	cactatcatt	tcttccctct	ttcttcccc	ggcaacgcta	tttcatttgt	720
ccctcccg	gtcctgcgc	agttcacaaa	cactccttcc	ctgcgcctcc	agcgcgcga	780
tgacaccata	ctctccatcc	cttctcgtgc	cgggtcgtgg	caacacacat	ctcgcgtccc	840
cccccccg	ttcgcgtccc	ccccacacac	tccccctccc	ccctcactcc	cgggtatccag	900
ccctccccac	actacaccgc	tgggggcccg	cgccccgc	ccccctctc	cccgtctcgg	960
ccgcggcccc	acctggacac	cacacaccct	ctcgcgcgc	ccccccctcc	tcactttgcg	1020
caaaaccccc	cataccccc	ctccctcgcc	cccggatcac	agccccgatca	ccaactcacc	1080
ccgcgcgc	ctccgcgtcg	ccccgcgcgc	cacaccgc			1120

<210> 249
 <211> 353
 <212> DNA
 <213> Homo sapiens

<400> 249						
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agagcctatt	gctgttggg	actacatgtc	catattgggt	gtttctgcct	ttctggctaa	180
tttgtggctg	ttgatgacca	tctcgacttc	ccagatgtta	aatatgacaa	aaataacct	240
tcttgcctt	tttcttcacc	tttcagctct	cagaattggc	agtacacccc	acagcttctt	300

gctaaagtcc tatcacctgg ggacccactt ttcattatth cecatgaact cac 353

<210> 250
 <211> 372
 <212> DNA
 <213> Homo sapiens

<400> 250
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 gtaaattaat ttcacaatac aagcaagatg tgacaaatgc tatgaaagaa ataagacaga 120
 atgatataat ggagtgactg ggaaaaggag gacatgtgaa tttggagtgc aggaaagtca 180
 tttataagca ggagatattt gaggtatatac aaagggtctgg gtacagagca atctggacag 240
 cagtacagca agcacaaaagg tcttaaaatg ggaacaagct cggatggat ggagacaaat 300
 acaaacattg gaaggaataa agttaccaac acagctttcc cacaggtgat gagaaagccc 360
 aactgagaga aa 372

<210> 251
 <211> 441
 <212> DNA
 <213> Homo sapiens

<400> 251
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 tgtactataa ttgccacatt aaaaagtaaa gtaataatgt cttaaaggat tttaaaagta 180
 aaggaaaaat atcacatagt gctcaatag atgatgaaat ctgaagtcaa tttataatta 240
 agacttagaa atgaacagtt tgataaaaga aaaactctaa agcaaaccatc acacttagtg 300
 gtggaatgct gaaatgttcc ctttgagatt cgaaccaga ttaggatgat cactctcatc 360
 atgtctatth aacattttgc tgtaaattca agatgctgtg gtatgataag aaaaagacga 420
 aatcgtcgac ccggaattc c 441

<210> 252
 <211> 342
 <212> DNA
 <213> Homo sapiens

<400> 252
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 aacactaaat ttacaaattg cacatttatg caaatggttg taccaaggct tctctctgta 120
 cccaattgc tcaacacagc tccactgttc ttacatggg agaaaaccgt aaaaactcag 180
 tattctggaa taatctttta attcaaaagt agaatagaaa cagcagagaa aagtataggg 240
 gataccaaaag agagaattca gccaaagtaa atatagaata cactgtcttc ctgcttttcc 300
 tacctaaacc acattattgc cctattctta atcccccaa aa 342

<210> 253
 <211> 349
 <212> DNA
 <213> Homo sapiens

<400> 253
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 ctgtgccctc cagggtattg ttttccttcc tgttcagtgc ccatgctctt gctgtgttt 120

ctcctgtacc	tttcccagga	cctagcagac	agccgagcac	ctgcccactg	ctctgtaa	180
actgacctgc	atctcaagt	gggtagcctt	tgtgtacttt	cccatttcca	agttgattg	240
cctgtgaatc	ccatatgtga	acacatatgc	agatgtccct	gatgtgctct	ttcctgcttg	300
gaggcacatg	caaggatgtg	gcactttttc	taattgcttg	aacagtcaa		349

<210> 254
 <211> 366
 <212> DNA
 <213> Homo sapiens

<400> 254						
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agaacatgtc	attgtatctc	tcttaacatt	ttatagagtc	ctcctctata	aagagataat	120
tggactgcat	cattgttttc	aacattttca	tg ttaatgca	tttttactat	cacccctccc	180
cccatcatga	ctattgccct	actttgagta	gacatagatt	gagaatattg	tttggctaaa	240
accatcacat	tcatcagtta	cgagccactg	tttactat	ctagaggtaa	ttttgagaaa	300
attgtgaatg	acagcacttc	tctcctggga	ttactaatta	acacttgagc	agatttgtac	360
aggcta						366

<210> 255
 <211> 400
 <212> DNA
 <213> Homo sapiens

<400> 255						
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aggatgtgca	tg tttgtgca	tgcaogagga	cacacagagc	acacgagcac	ccacaggaca	120
catagacaag	ccaaagggca	ctcatgtgtg	ggggctcaaac	atctgagagc	gtgtgaccag	180
tg tgaagtctg	aagaccatag	actctagtga	cagggtgtctg	agatggccac	gggctgcatt	240
agaaacacta	agaggctcac	tg cctgctct	gtccccattg	gatccctcgg	caggctccag	300
tgacagcaaa	ctgtggcatg	gagccccag	aggacctagc	acttaacctt	ggagcttccc	360
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<210> 256
 <211> 338
 <212> DNA
 <213> Homo sapiens

<400> 256						
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acctgcatag	cactgttcta	attaataaac	agtttctata	aacatcaagg	aacatcacct	120
agagcattaa	tcaggtacca	aacaatttaa	ccattgactt	cacacatatg	catatgtagg	180
tg gatgctca	tacagtttac	cttctttttt	cccatttccc	agagattttg	gttttgtttg	240
ttgttttttt	tccccaaac	ctttaagtgt	atgaaattct	attctttgat	tgaagtcagg	300
gaaggcgtat	gcattcacca	gagaagtcaa	tttgttca			338

<210> 257
 <211> 336
 <212> DNA
 <213> Homo sapiens

<400> 257

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gttctgtaa	aa	ttcttcctgg	aagggagggtg	tattaaggga	gatcagtgta	attttggttca	180
tgatgcagag	ag	ttgtagaaaa	gaaaagacat	gtgcaaattt	tattttcaag	gatgttggtgc	240
caaaggaaa	ag	aagtgcattt	atatgcataa	tgaatttcca	tgcaagttct	atcatagtg	300
agcaaaatgt		taccagggag	gcttctgtga	attttc			336

<210> 258
 <211> 358
 <212> DNA
 <213> Homo sapiens

<400> 258							
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aaatctctaa	ccagtcctcc	atgcccaacc	gcatagaact	ctctgctctg	ttcaggggtac		120
catttcatgt	tgattggcct	ttatttgctt	ttgttttttt	ccctctgtgt	tatgtccttg		180
ggttctgcct	accttccaca	gtcaaaacac	attcgttgat	tgtgggtgct	gtttttcaaa		240
gtgagattgt	cactaatgtt	tgccagattt	ataaatgtaa	aacaacttga	cagattttgt		300
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<210> 259
 <211> 1092
 <212> DNA
 <213> Homo sapiens

<400> 259							
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tcaagatatg	aagttaaaat	taggtactgg	gattgtctac	ctgagttttg	gtccttgaga		180
tgatgctttt	ctgtgtgcag	atagttgcta	aaatttggtg	ttcctgctgg	gggtacaaac		240
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aatacataga	atagtgcag	ctcgagagtt	agtttttagt	gcctttccag	gtaggaccat		480
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cacggaaaat	acgttttact	ggatcgagtc	ttgctctgct	cggctcttcc	cttttaccct		600
acatttctct	ctctcgatct	tccgtgcagc	gtaccacgcc	catctgactc	gagagctccc		660
cacctgcaaa	cctttatctt	ccttggtgag	gctgcctagc	ggatcccttc	gccaccgagg		720
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gcgtcccttt	gactgaagaa	ccatccctcg	caccttctac	tcagggcgcg	cggcggtacta		1020
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tcacgcgcgg	cc						1092

<210> 260
 <211> 317
 <212> DNA
 <213> Homo sapiens

<400> 260							
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atgccttaga	cagcttggtc	tggtccattc	caaatgccac	tctcaacact	cctgcagagc		180

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gggaggcata cagtactcaa tgcacgtgag tctctttctt tcttcaccca taaactatga 240
caatggtttt ttagtgtctc ccaccttccc tttacatgtc aaactgagct tcctaaaata 300
ctcctttaaa tgcatca 317

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<210> 261
 <211> 1187
 <212> DNA
 <213> Homo sapiens

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<400> 261
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caggtggaga ggagtgggta gcaagagttc tgtgtaaata cttgggaggc atccaagcgg 300
agagttaagt aggcactgaa tatttaagtt gagctgaggg gagtgatcta gactggacat 360
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tatttggatt tgacaacatg atggtgactg ttttgacaag tgcgccaaag cacattggga 720
tgcttcgaag agaaaatagg aaatgggggtg aatatcgaca gcttcggttg gaaattttgc 780
tgctggaaag tggaagaaaa acacttatgg gcttcgaggg agatggggcc aaaaagaggg 840
cttttttttt ttattttttt tttagacaca gaccttcag ttctcggcgg ggggggcggg 900
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gccgggcctc gccgcaaaaa caaacagtc tccttctttt ctttcttgac aggggcccgtc 1140
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```

<210> 262
 <211> 69
 <212> PRT
 <213> Homo sapiens

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<400> 262
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Ser Phe Phe Ile Leu Val Ser Glu Asn Asn Asn Asn Asp Leu Phe Leu
20          25          30
Ile Leu Met Val Leu Leu Leu Val Ser Leu Gly Leu Thr Leu Ala Val
35          40          45
Leu Val Asp Trp Leu Gln Leu Glu Asp Leu Lys Met Ala Ser Pro Ile
50          55          60
Cys Leu Gly Pro *
65          68

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<210> 263
 <211> 97
 <212> PRT
 <213> Homo sapiens

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<400> 263
Met Met Gln Leu Leu Phe Pro Leu Pro Leu Trp Gly Ile Ile Pro Phe

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      1           5           10           15
His Leu His Cys Cys Asp Ile Val Cys Pro Leu Ser Gln Val Glu Gly
      20           25           30
Gly Ile Leu Arg Leu Pro Pro Ala Leu Val His Ser Ile Phe Leu Leu
      35           40           45
His Ala Ala Cys Val Met Ile Ser Cys Lys Ala Phe Asn Ile Lys Ser
      50           55           60
Pro Leu Cys Val Arg Pro His Val Glu Arg Lys Thr Cys Leu Arg Glu
      65           70           75           80
Glu Val Cys Cys Val Ser Pro Phe Ser Ser Pro Gln Ile Cys Val Ser
      85           90           95  96
*
```

```

<210> 264
<211> 50
<212> PRT
<213> Homo sapiens
```

```

      <400> 264
Met Ser Arg Phe Phe Ile Phe Cys Cys Leu Arg His Phe Ser Tyr Phe
      1           5           10           15
Ser Asp Phe Ala Val Leu Phe Leu Gly Ala Leu Glu His Leu Lys Tyr
      20           25           30
Gln Leu Ala Val Gly His Ser Val Leu Ser Glu Ser Thr Asp Gly Asn
      35           40           45
Val *
49
```

```

<210> 265
<211> 51
<212> PRT
<213> Homo sapiens
```

```

      <400> 265
Met Ala Tyr Arg Gly Gln Leu Leu Ala Gly Phe Thr Phe Asp Val Ser
      1           5           10           15
Ala Cys Leu Trp Thr Ser Trp Arg Thr Ala Leu Thr Glu Cys Val Ala
      20           25           30
Trp Gly Ile Cys Pro Leu Gly Trp Val Val Pro Val Leu Gly Pro Val
      35           40           45
Asp Gly *
50
```

```

<210> 266
<211> 64
<212> PRT
<213> Homo sapiens
```

```

      <400> 266
Met His Arg Gly Val Leu Val Thr Leu Leu Lys Ile Thr Val Leu Lys
      1           5           10           15
Ser Met His Arg Gly Ile Leu Val Thr Leu Leu Lys Ile Thr Ile Leu
      20           25           30
Lys Ser Met His Arg Gly Val Leu Asp Thr Leu Leu Lys Ile Thr Ile
```

	35					40				45					
Leu	Lys	Ser	Met	His	Arg	Gly	Val	Leu	Val	Thr	Leu	Leu	Lys	Ile	Thr
	50					55					60				64

<210> 267
 <211> 202
 <212> PRT
 <213> Homo sapiens

<400> 267

Met	Val	Met	Leu	Ala	Ala	Leu	Ala	His	His	Leu	Phe	Tyr	Trp	Asp	Val
1				5					10					15	
Trp	Phe	Ile	Tyr	Asn	Val	Cys	Leu	Ala	Lys	Val	Lys	Gly	Tyr	Arg	Ser
		20						25					30		
Leu	Ser	Thr	Ser	Gln	Thr	Phe	Tyr	Asp	Ala	Tyr	Ile	Ser	Tyr	Asp	Thr
		35					40					45			
Lys	Asp	Ala	Ser	Val	Thr	Asp	Trp	Val	Ile	Asn	Glu	Leu	Arg	Tyr	His
	50					55					60				
Leu	Glu	Glu	Ser	Arg	Asp	Lys	Asn	Val	Leu	Leu	Cys	Leu	Glu	Glu	Arg
	65				70					75					80
Asp	Trp	Asp	Pro	Gly	Leu	Ala	Ile	Ile	Asp	Asn	Leu	Met	Gln	Ser	Ile
				85					90					95	
Asn	Gln	Ser	Lys	Lys	Thr	Val	Phe	Val	Leu	Thr	Lys	Lys	Tyr	Ala	Lys
		100					105						110		
Ser	Trp	Asn	Phe	Lys	Thr	Ala	Phe	Tyr	Leu	Ala	Leu	Gln	Arg	Leu	Met
		115					120					125			
Asp	Glu	Asn	Met	Asp	Val	Ile	Ile	Phe	Ile	Leu	Leu	Glu	Pro	Val	Leu
	130					135						140			
Gln	His	Ser	Gln	Tyr	Leu	Arg	Leu	Arg	Gln	Arg	Ile	Cys	Lys	Ser	Ser
	145				150					155					160
Ile	Leu	Gln	Trp	Pro	Asp	Asn	Pro	Lys	Ala	Glu	Gly	Leu	Phe	Trp	Gln
			165						170					175	
Thr	Leu	Arg	Asn	Val	Val	Leu	Thr	Glu	Asn	Asp	Ser	Arg	Tyr	Asn	Asn
			180					185						190	
Met	Tyr	Val	Asp	Ser	Ile	Lys	Gln	Tyr	*						
		195					200	201							

<210> 268
 <211> 87
 <212> PRT
 <213> Homo sapiens

<400> 268

Met	Leu	Phe	Trp	Leu	Ile	Lys	Val	Ser	Cys	Ser	Phe	Ser	Cys	Ser	Asp
1				5					10					15	
Glu	Thr	Ser	Ala	Ala	Ser	Trp	Gly	Phe	Gly	Ala	Phe	Ser	Phe	Ser	Phe
			20					25					30		
Leu	Leu	Leu	Gly	Ile	Ser	Cys	Leu	Met	Arg	Leu	Val	Pro	Asp	Thr	Phe
		35					40					45			
Val	Leu	Phe	Ser	Phe	Ser	Cys	Glu	Leu	Phe	Ser	Cys	Phe	Arg	Gly	Leu
	50					55					60				
Ile	Gly	Gly	Arg	Gly	Leu	Ser	Ser	Ser	Pro	Leu	Ile	Asn	Leu	Ser	Tyr
	65				70					75					80
Gly	Arg	Ile	Asn	Leu	Ser	*									
				85	86										

<210> 269
 <211> 343
 <212> PRT
 <213> Homo sapiens

<400> 269
 Met Leu Gln Gly His Ser Ser Val Phe Gln Ala Leu Leu Gly Thr Phe
 1 5 10 15
 Phe Thr Trp Gly Met Thr Ala Ala Gly Ala Leu Val Phe Val Phe
 20 25 30
 Ser Ser Gly Gln Arg Arg Ile Leu Asp Gly Ser Leu Gly Phe Ala Ala
 35 40 45
 Gly Val Met Leu Ala Ala Ser Tyr Trp Ser Leu Leu Ala Pro Ala Val
 50 55 60
 Glu Met Ala Thr Ser Ser Gly Gly Phe Gly Ala Phe Ala Phe Phe Pro
 65 70 75 80
 Val Ala Val Gly Phe Thr Leu Gly Ala Ala Phe Val Tyr Leu Ala Asp
 85 90 95
 Leu Leu Met Pro His Leu Gly Ala Ala Glu Asp Pro Gln Thr Ala Leu
 100 105 110
 Ala Leu Asn Phe Gly Ser Thr Leu Met Lys Lys Lys Ser Asp Pro Glu
 115 120 125
 Gly Pro Ala Leu Leu Phe Pro Glu Ser Glu Leu Ser Ile Arg Ile Gly
 130 135 140
 Arg Ala Gly Leu Leu Ser Asp Lys Ser Glu Asn Gly Glu Ala Tyr Gln
 145 150 155 160
 Arg Lys Lys Ala Ala Ala Thr Gly Leu Pro Glu Gly Pro Ala Val Pro
 165 170 175
 Val Pro Ser Arg Gly Asn Leu Ala Gln Pro Gly Gly Ser Ser Trp Arg
 180 185 190
 Arg Ile Ala Leu Leu Ile Leu Ala Ile Thr Ile His Asn Val Pro Glu
 195 200 205
 Gly Leu Ala Val Gly Val Gly Phe Gly Ala Ile Glu Lys Thr Ala Ser
 210 215 220
 Ala Thr Phe Glu Ser Ala Arg Asn Leu Ala Ile Gly Ile Gly Ile Gln
 225 230 235 240
 Asn Phe Pro Glu Gly Leu Ala Val Ser Leu Pro Leu Arg Gly Ala Gly
 245 250 255
 Phe Ser Thr Trp Arg Ala Phe Trp Tyr Gly Gln Leu Ser Gly Met Val
 260 265 270
 Glu Pro Leu Ala Gly Val Phe Gly Ala Phe Ala Val Val Leu Ala Glu
 275 280 285
 Pro Ile Leu Pro Tyr Ala Leu Ala Phe Ala Ala Gly Ala Met Val Tyr
 290 295 300
 Val Val Met Asp Asp Ile Ile Pro Glu Ala Gln Ile Ser Gly Asn Gly
 305 310 315 320
 Lys Leu Ala Ser Trp Ala Ser Ile Leu Gly Phe Val Val Met Met Ser
 325 330 335
 Leu Asp Val Gly Leu Gly *
 340 342

<210> 270
 <211> 66
 <212> PRT
 <213> Homo sapiens

<400> 270
 Met Lys Cys Lys Leu Ile Pro Val Cys Pro Phe Leu Arg Leu Asn Thr

```

      1           5           10           15
Gln Pro Leu Leu Ile Ile Ser Tyr Gly Ile Phe Leu His Ile Phe Arg
      20           25           30
Asp Phe Ser Tyr Ile His Arg Val Arg Glu Arg His Ser Val Phe Leu
      35           40           45
Ser Val Gly Gln Gln Trp Cys Pro Glu Leu Thr Arg Ser Ile Phe Leu
      50           55           60
Leu Asn
      65      66

```

```

<210> 271
<211> 209
<212> PRT
<213> Homo sapiens

```

```

      <400> 271
Met Gly Leu Gly Ala Arg Gly Ala Trp Ala Ala Leu Leu Leu Gly Thr
      1           5           10           15
Leu Gln Val Leu Ala Leu Leu Gly Ala Ala His Glu Ser Ala Ala Met
      20           25           30
Ala Ala Ser Ala Asn Ile Glu Asn Ser Gly Leu Pro His Asn Ser Ser
      35           40           45
Ala Asn Ser Thr Glu Thr Leu Gln His Val Pro Ser Asp His Thr Asn
      50           55           60
Glu Thr Ser Asn Ser Thr Val Lys Pro Pro Thr Ser Val Ala Ser Asp
      65           70           75           80
Ser Ser Asn Thr Thr Val Thr Thr Met Lys Pro Thr Ala Ala Ser Asn
      85           90           95
Thr Thr Thr Pro Gly Met Val Ser Thr Asn Met Thr Ser Thr Thr Leu
      100          105          110
Lys Ser Thr Pro Lys Thr Thr Ser Val Ser Gln Asn Thr Ser Gln Ile
      115          120          125
Ser Thr Ser Thr Met Thr Val Thr His Asn Ser Ser Val Thr Ser Ala
      130          135          140
Ala Ser Ser Val Thr Ile Thr Thr Thr Met His Ser Glu Ala Lys Lys
      145          150          155          160
Gly Ser Lys Phe Asp Thr Gly Ser Phe Val Gly Gly Ile Val Leu Thr
      165          170          175
Leu Gly Val Leu Ser Ile Leu Tyr Ile Gly Cys Lys Met Tyr Tyr Ser
      180          185          190
Arg Arg Gly Ile Arg Tyr Arg Thr Ile Asp Glu His Asp Ala Ile Ile
      195          200          205          208

```

*

```

<210> 272
<211> 105
<212> PRT
<213> Homo sapiens

```

```

<221> misc_feature
<222> (1)...(105)
<223> Xaa = any amino acid or nothing

```

```

      <400> 272
Met Trp Leu Pro Pro Ala Leu Leu Leu Leu Ser Leu Ser Gly Cys Phe
      1           5           10           15
Ser Ile Gln Gly Pro Glu Ser Val Arg Ala Pro Glu Gln Gly Ser Leu

```

```

      20      25      30
Thr Val Gln Cys His Tyr Lys Gln Gly Trp Glu Thr Tyr Ile Lys Trp
      35      40      45
Trp Cys Arg Gly Val Arg Trp Asp Thr Cys Lys Ile Leu Ile Glu Thr
      50      55      60
Arg Gly Ser Glu Gln Gly Glu Lys Ser Asp Arg Val Ser Ile Lys Asp
      65      70      75      80
Asn Gln Lys Asp Arg Thr Phe Thr Val Thr Met Glu Gly Leu Arg Arg
      85      90      95
Asp Asp Ala Xaa Val Tyr Trp Cys Gly
      100      105

```

<210> 273
 <211> 61
 <212> PRT
 <213> Homo sapiens

```

<400> 273
Met Lys Phe His Leu Ser Phe Phe Ser Leu Lys Arg Ala Ile Phe Tyr
 1      5      10      15
Ile Cys Ala Lys Ala Asp Lys Ile Ser Gly Gly Tyr Leu Tyr Lys Cys
      20      25      30
Arg Thr Val Ser Tyr Ser Gly Lys Asn Val Arg Ser Gly Val Lys Ile
      35      40      45
Ser Gly Phe Leu Ser Ala Cys Ile Ile Ser Tyr Leu *
      50      55      60

```

<210> 274
 <211> 149
 <212> PRT
 <213> Homo sapiens

```

<400> 274
Met His Met Leu Asn Gly Ala Leu Leu Ala Leu Leu Phe Pro Val Val
 1      5      10      15
Asn Thr Arg Leu Leu Pro Phe Glu Leu Glu Ile Tyr Tyr Ile Gln His
      20      25      30
Val Met Leu Tyr Val Val Pro Ile Tyr Leu Leu Trp Lys Gly Gly Ala
      35      40      45
Tyr Thr Pro Glu Pro Leu Ser Ser Phe Arg Trp Ala Leu Leu Ser Thr
      50      55      60
Gly Leu Met Phe Phe Tyr His Phe Ser Val Leu Gln Ile Leu Gly Leu
      65      70      75      80
Val Thr Glu Val Asn Leu Asn Asn Met Leu Cys Pro Ala Ile Ser Asp
      85      90      95
Pro Phe Tyr Gly Pro Trp Tyr Arg Ile Trp Ala Ser Gly His Gln Thr
      100      105      110
Leu Met Thr Met Thr His Gly Lys Leu Val Ile Leu Phe Ser Tyr Met
      115      120      125
Ala Gly Pro Leu Cys Lys Tyr Leu Leu Asp Leu Leu Arg Leu Pro Ala
      130      135      140
Lys Lys Ile Asp *
      145      148

```

<210> 275
 <211> 258

<212> PRT

<213> Homo sapiens

<400> 275

```

Met Arg Trp Ile Ala Phe Ala Val Met Ile Val Leu Ala Leu Ile Arg
 1           5           10           15
Ile Gly His Gly Gln Gly Glu Gly His Pro Pro Leu Ala Asp Phe Ser
           20           25           30
Gly Val Arg Asn Leu Phe Gly Val Cys Val Tyr Ser Phe Met Cys Gln
           35           40           45
His Ser Leu Pro Ser Leu Ile Thr Pro Val Ser Ser Lys Arg His Leu
           50           55           60
Thr Arg Leu Val Phe Leu Asp Tyr Val Leu Ile Leu Ala Phe Tyr Gly
           65           70           75           80
Leu Leu Ser Phe Thr Ala Ile Phe Cys Phe Arg Gly Asp Ser Leu Met
           85           90           95
Asp Met Tyr Thr Leu Asn Phe Ala Arg Cys Asp Val Val Gly Leu Ala
           100          105          110
Ala Ala Arg Leu Phe Leu Gly Leu Phe Pro Val Phe Thr Ile Ser Thr
           115          120          125
Asn Phe Pro Ile Ile Ala Val Thr Leu Arg Asn Asn Trp Lys Thr Leu
           130          135          140
Phe His Arg Glu Gly Gly Thr Tyr Pro Trp Val Val Asp Arg Val Val
           145          150          155          160
Phe Pro Thr Ile Thr Leu Val Pro Pro Val Leu Val Ala Phe Cys Thr
           165          170          175
His Asp Leu Glu Ser Leu Val Gly Ile Thr Gly Ala Tyr Ala Gly Thr
           180          185          190
Gly Ile Gln Tyr Val Ile Pro Ala Phe Leu Val Tyr His Cys Arg Arg
           195          200          205
Asp Thr Gln Leu Ala Phe Gly Cys Gly Val Ser Asn Lys His Arg Ser
           210          215          220
Pro Phe Arg His Thr Phe Trp Val Gly Phe Val Leu Leu Trp Ala Phe
           225          230          235          240
Ser Cys Phe Ile Phe Val Thr Ala Asn Ile Ile Leu Ser Glu Thr Lys
           245          250          255
Leu *
257

```

<210> 276

<211> 101

<212> PRT

<213> Homo sapiens

<400> 276

```

Met Ala Leu Ala Leu Ala Ala Tyr Val Cys Gly Trp Val Val Asp Arg
 1           5           10           15
Glu Thr Trp Pro Val Pro Met Pro Cys Asn Lys Gly Gly Arg Ala Cys
           20           25           30
Asn Leu Glu Met Gly Met Glu Trp Leu Asn Leu His Cys Glu Val Ser
           35           40           45
Lys Trp Gln Gln Pro Pro Ser Gly Ala Leu Cys Cys Ser Leu Ala Pro
           50           55           60
Leu Gln Ser Ile Phe Phe Pro Ala Ala Lys Val Met Phe Lys Asn Gly
           65           70           75           80
Ser Trp Thr Val Leu Leu Pro Cys Ser Glu Phe Pro Ile Gly Phe Pro
           85           90           95
Ser His Leu Glu *
           100

```

<210> 277
 <211> 82
 <212> PRT
 <213> Homo sapiens

<400> 277
 Met Arg Cys Gly Trp Gly Pro Leu Gly Cys Leu Gly Thr Gly Ala Pro
 1 5 10 15
 Ala Gly Trp Met Val Leu Gly Ser Pro Arg Ser Gln Leu Gln Arg Ala
 20 25 30
 Arg Trp Ser Arg Ala Ser Leu Ser Ala Phe Gly Trp Glu Ile Arg Leu
 35 40 45
 Arg Pro Glu Gly Pro Lys Ala Pro Arg Gln Leu Leu Leu Val Ala Leu
 50 55 60
 Glu Ser Glu Thr Leu Gly Val His Gly Gly Ala Thr Pro Leu His Cys
 65 70 75 80
 Leu *
 81

<210> 278
 <211> 65
 <212> PRT
 <213> Homo sapiens

<400> 278
 Met Asn Asn Ser Pro Leu Ala Leu Phe Ser Trp Glu Gly Trp Lys Lys
 1 5 10 15
 Phe Leu Val Leu Leu Pro Ala Phe Cys Ile Thr Pro Ser Gln Ser Thr
 20 25 30
 Ser Phe Ser Asn Ile Val Pro Thr Tyr Gln Tyr Cys Thr Pro Gly
 35 40 45
 Ser Cys Gln Ala Val His Ser Asn Ala Val Gly Gly Asn Thr Trp Lys
 50 55 60 64
 *

<210> 279
 <211> 89
 <212> PRT
 <213> Homo sapiens

<400> 279
 Met Phe Ser Cys Phe Phe Ser Thr Ser Leu Ala Thr Ser Val Ser Leu
 1 5 10 15
 Glu Ala Gln Ser Cys Phe Ala Trp Pro Leu Ile Val Ser Phe Pro Gln
 20 25 30
 Gly Ser Leu Leu Ser Pro Phe Leu Leu Met Ser Tyr Asn Leu Ser His
 35 40 45
 Leu Ile Tyr Ser Gly Glu Leu Asn Gly Arg Leu Tyr Ala Glu Asn Ser
 50 55 60
 Gln Ile Cys Ile Cys Ser Pro Ala Phe Pro Thr Lys Leu Tyr Leu His
 65 70 75 80
 Ile Phe Ala Asp Leu Ile Thr Ser *
 85 88

<210> 280
 <211> 57
 <212> PRT
 <213> Homo sapiens

<400> 280
 Met Cys Leu Ala His Leu Phe Lys Leu Leu Val Tyr Phe Asn Arg Ser
 1 5 10 15
 Asn Ser Trp Val Gln Ala Pro Phe Val Leu Glu Thr Thr Thr Gly Leu
 20 25 30
 Phe Ser Ser Ser Val Ser Leu Ile Cys Ile Leu Asn Leu Phe Cys Lys
 35 40 45
 Gln Asn Leu Asn Asn Asn Phe Leu *
 50 55 56

<210> 281
 <211> 65
 <212> PRT
 <213> Homo sapiens

<400> 281
 Met Leu Pro Pro Leu Cys Trp Cys Cys Val Arg Thr Met Thr Cys Cys
 1 5 10 15
 Ile Gly Thr Ser Thr Gly Met Asp Gly Arg Pro Pro Ser Pro Trp Arg
 20 25 30
 Arg Ile Pro Cys Trp Thr Gln Thr Cys Ser Cys Arg Asn Ser Ala Thr
 35 40 45
 Pro Ser Ser Pro His Phe Leu His Thr Ser Arg Trp Pro Gly Pro Met
 50 55 60
 Tyr
 65

<210> 282
 <211> 78
 <212> PRT
 <213> Homo sapiens

<400> 282
 Met Thr Ala Arg Phe Leu Ile Cys Leu Phe Gln Thr Thr Met Tyr Ala
 1 5 10 15
 Glu Phe Asn Leu Gly Gln Arg Arg Trp Gln Thr Arg Asn Ala Pro Asn
 20 25 30
 Leu Ser Gly Trp Leu Gly Leu Ala Gly Ala Ala Pro Trp Gln Gly Arg
 35 40 45
 Ile Ser Pro Met Leu Gly Thr Lys Val Ser Leu Cys Asn Leu Ser Glu
 50 55 60
 Glu Ser Leu Ala Pro Leu Ala Lys His Thr Pro Arg Ala *
 65 70 75 77

<210> 283
 <211> 61
 <212> PRT
 <213> Homo sapiens

<400> 283

```

Met Ser Pro Thr Gly Leu Leu Val Val Phe Ala Pro Val Val Leu Gly
 1          5          10          15
Leu Lys Ala Ile Thr Leu Ala Ala Leu Leu Leu Ala Leu Ala Thr Ser
          20          25          30
Arg Arg Ser Pro Gly Gln Glu Asp Val Lys Thr Thr Gly Pro Ala Gly
          35          40          45
Ala Met Asn Thr Leu Ala Trp Ser Lys Gly Gln Glu *
          50          55          60

```

<210> 284

<211> 61

<212> PRT

<213> Homo sapiens

<400> 284

```

Met Ser Pro Thr Gly Leu Leu Val Val Phe Ala Pro Val Val Leu Gly
 1          5          10          15
Leu Lys Ala Ile Thr Leu Ala Ala Leu Leu Leu Ala Leu Ala Thr Ser
          20          25          30
Arg Arg Ser Pro Gly Gln Glu Asp Val Lys Thr Thr Gly Pro Ala Gly
          35          40          45
Ala Met Asn Thr Leu Ala Trp Ser Lys Gly Gln Glu *
          50          55          60

```

<210> 285

<211> 66

<212> PRT

<213> Homo sapiens

<400> 285

```

Met Phe Phe Trp Arg Leu Leu Ile Leu Tyr Ser Ser Pro Glu Ile Thr
 1          5          10          15
Val Cys Leu His Leu Phe Thr Ser Ser Gly Leu Lys Met Gln His Leu
          20          25          30
Arg Ser His Cys His Leu Phe Arg Gln Ala Leu Phe Leu Cys Phe Ser
          35          40          45
Asp Thr Thr Val Met Gly Phe Phe Leu Ser Tyr Trp Trp Gln Phe Ser
          50          55          60
Val *
          65

```

<210> 286

<211> 50

<212> PRT

<213> Homo sapiens

<400> 286

```

Met Trp Ser Val Thr Ser Thr Ile Phe Ile Cys Arg Leu Leu Ile Val
 1          5          10          15
Arg Leu Leu Gly Asn Thr Ala Val Arg Thr Ser Val Val Phe Leu Pro
          20          25          30
His Lys Ala Gly Arg His Trp Glu Lys Ser Thr Ser Leu Val Ser Gly

```

35 40 45
 Gly *
 49

<210> 287
 <211> 63
 <212> PRT
 <213> Homo sapiens

<400> 287
 Met Trp Ala Asp Ser Ile Leu Ala Ser Leu Leu Leu Trp Pro His Gln
 1 5 10 15
 Ser Leu Gln Leu Trp His His Pro His Leu Ala Asn Lys Asn Met Gly
 20 25 30
 Val Pro Pro Pro Thr Thr Cys Lys Pro Trp Ser Thr Val Ala Gln Lys
 35 40 45
 Phe Ala Asp Tyr Ile Pro Phe Met Thr Thr Trp Pro Pro Leu Gly
 50 55 60 63

<210> 288
 <211> 170
 <212> PRT
 <213> Homo sapiens

<400> 288
 Met Arg Leu Leu His Cys Lys Thr Leu His Ile Val Leu Phe Thr Leu
 1 5 10 15
 Leu Tyr Lys Ile Leu Met Asp His Gln Asn Leu Ser Glu His Val Leu
 20 25 30
 Cys Met Val Leu Tyr Leu Ile Glu Leu Gly Leu Glu Asn Ser Ala Glu
 35 40 45
 Glu Glu Ser Asp Glu Glu Ala Ser Val Gly Gly Pro Glu Arg Cys His
 50 55 60
 Asp Ser Trp Phe Pro Gly Ser Asn Leu Val Ser Asn Met Arg His Phe
 65 70 75 80
 Ile Asn Tyr Val Arg Val Arg Val Pro Glu Thr Ala Pro Glu Val Lys
 85 90 95
 Arg Asp Ser Pro Ala Ser Thr Ser Ser Asp Asn Leu Gly Ser Leu Gln
 100 105 110
 Asn Ser Gly Thr Ala Gln Val Phe Ser Leu Val Ala Glu Arg Arg Lys
 115 120 125
 Lys Phe Gln Glu Ile Ile Asn Arg Ser Ser Ser Glu Ala Asn Gln Val
 130 135 140
 Val Arg Pro Thr Thr Ser Ser Lys Trp Ser Ala Pro Gly Ser Ala Pro
 145 150 155 160
 Gln Leu Thr Thr Ala Ile Phe Gly Asn *
 165 169

<210> 289
 <211> 69
 <212> PRT
 <213> Homo sapiens

<400> 289
 Met Lys Met Phe Gln Met Leu Leu Thr Ser Ser Phe Cys Ser Leu Ser

```

      1           5           10           15
His Leu Gln Ser Cys Gln His Ile Ser Phe Leu Ser Ile Ser Asn His
      20           25           30
Ser Lys Ile Phe Leu Tyr Leu Gln Pro Thr Cys Tyr Leu Tyr Leu Pro
      35           40           45
Pro Leu Pro Leu Phe Ser Arg Ser Trp His Trp Asn Leu Arg Val His
      50           55           60
Ile Cys Ser Pro *
      65           68

```

```

<210> 290
<211> 102
<212> PRT
<213> Homo sapiens

```

```

      <400> 290
Met Cys Val Ala Ala Cys Phe Ser Leu Val Ala Trp Ser Ile Leu Gln
      1           5           10           15
Trp Gly Lys Arg Lys Tyr Pro Glu Gly Asn Ser Ser Trp Gln Ile Lys
      20           25           30
Glu Lys Val Trp Arg Phe Ser Thr Ala Phe Cys Ser Val Asn Glu Trp
      35           40           45
Lys Phe Ala Asp Ile Leu Ser Met Ala Asp His Leu Lys Lys Cys Ser
      50           55           60
Tyr Asn Val Val Glu Lys Arg Glu Glu Ala Ile Pro Leu Pro Cys Met
      65           70           75           80
Cys Val Thr Arg Glu Leu Thr Lys Glu Gly Arg Ser Leu Arg Ser Val
      85           90           95
Leu Lys Pro Val Leu *
      100 101

```

```

<210> 291
<211> 68
<212> PRT
<213> Homo sapiens

```

```

      <400> 291
Met Cys Thr Phe Arg Gly Leu Leu Thr Gly Leu Leu Thr Phe Pro Leu
      1           5           10           15
Phe Ser Pro Val Leu Tyr Phe Cys Asn Lys Phe Pro Asn Lys Thr Asn
      20           25           30
Met Phe Leu Leu Cys Phe Cys Lys Asn Tyr Phe Leu Ser Thr Val Phe
      35           40           45
Phe Ile Phe Leu Arg Gln Ser Phe Val Leu Val Ala Gln Thr Gly Val
      50           55           60
Gln Gly Val *
      65           67

```

```

<210> 292
<211> 105
<212> PRT
<213> Homo sapiens

```

```

      <400> 292
Met Lys Gly Ile Leu Phe Phe Phe Phe Trp Lys Gly Val Tyr Phe Ser

```

```

1           5           10           15
Pro Ser Leu Lys Pro Arg Gly Glu Ile Trp Val Asn Cys Pro Gln Pro
      20           25           30
Trp Gly Glu Gly Gly Pro Ile Gly Gly Lys Ile Lys Asn Gly Gly Val
      35           40           45
Phe Ser Gly Arg Glu Phe Phe Pro Thr Met Glu Lys Lys Lys Phe Pro
      50           55           60
Pro Arg Ala Lys Thr Lys Ile Asn Pro Pro Arg Lys Met Gly Ala Gln
      65           70           75           80
Arg Arg Pro Thr Pro Lys Trp Pro Thr Arg Gln Gly Pro Phe Asn Arg
      85           90           95
Ser Pro Lys Lys Gly Lys Arg Tyr Pro
      100           105

```

<210> 293
 <211> 95
 <212> PRT
 <213> Homo sapiens

```

<400> 293
Met Pro Trp Val Leu Gly Cys Thr Pro Phe Ile Ala Leu Ala Tyr Phe
1           5           10           15
Phe Leu Trp Phe Leu Pro Pro Phe Thr Ser Leu Arg Gly Leu Trp Tyr
      20           25           30
Thr Thr Phe Tyr Cys Leu Phe Gln Ala Leu Ala Thr Val Pro Tyr Thr
      35           40           45
Ala Leu Thr Met Leu Leu Thr Pro Cys Pro Arg Glu Arg Asp Ser Ala
      50           55           60
Thr Ala Tyr Arg Met Thr Val Glu Met Ala Gly Thr Leu Met Gly Ala
      65           70           75           80
Thr Val His Gly Leu Ile Val Ser Gly Ala His Arg Pro His Arg
      85           90           95

```

<210> 294
 <211> 52
 <212> PRT
 <213> Homo sapiens

```

<400> 294
Met Ala Val Glu Pro Leu Leu Ala His Phe Leu Arg Trp Ser Trp Leu
1           5           10           15
Ser Ala Arg Asp Phe Tyr Ser Leu Gly Asn Val Asp Pro Ala Leu Trp
      20           25           30
Val Pro Cys Phe Phe Leu Leu Phe Leu Leu Ile Ile Thr Asp Asn Asn
      35           40           45
Asn Asp Ser *
      50 51

```

<210> 295
 <211> 52
 <212> PRT
 <213> Homo sapiens

```

<400> 295
Met Cys Ser Val Thr Cys Gly Val Leu Phe Ala Leu Ser Gly Leu Leu

```

```

      1           5           10           15
Leu Tyr Ser Ser Pro Ser Pro His Trp Asn Arg Pro Ser Arg Ile Ala
      20           25           30
Val Tyr Leu Met Cys Leu Thr Lys Tyr Cys Thr Gly Ser Ser Ala Ala
      35           40           45
Ser Cys Gln *
      50  51

```

<210> 296
 <211> 57
 <212> PRT
 <213> Homo sapiens

```

      <400> 296
Met Pro Ala Cys Cys Tyr Arg Pro Cys Leu Leu Gln Pro Ile Ser Leu
      1           5           10           15
Leu Asn Ile Leu Leu Leu Met Arg Lys Pro Ser Gln Glu Val Ile
      20           25           30
Asn Asp Thr Pro Lys Ala Gly Lys Trp Leu Ser Arg Tyr Leu Asp Ser
      35           40           45
Gly Leu Phe Tyr Ser Cys Ala Cys Gly
      50           55           57

```

<210> 297
 <211> 88
 <212> PRT
 <213> Homo sapiens

```

      <400> 297
Met Trp Ser Trp His Val Gln Leu Gln Val Ser Ala Pro Leu His His
      1           5           10           15
Leu Leu Cys Leu His Phe Pro Pro Ala His Arg Ile Tyr Met Pro Phe
      20           25           30
Pro Ser Pro Lys Arg Ala Pro Ala Met Leu Asn Lys Gly Ile His Met
      35           40           45
Gln Gly Met Ser Ser Val Ser Trp Lys Gly Glu Ala Lys Phe Ser Phe
      50           55           60
His His Gln Arg Val Ala Phe Asn Ile Ile Tyr Thr Arg Gln Ala Phe
      65           70           75           80
Ala Leu Leu Val Leu Leu Asn *
      85           87

```

<210> 298
 <211> 52
 <212> PRT
 <213> Homo sapiens

```

      <400> 298
Met Gln Val Ser Gly Pro Arg Pro Gln Leu Phe Leu Pro Ser Val Phe
      1           5           10           15
Phe Val Leu Leu Phe Ser Tyr Thr Phe Thr Glu Thr Thr Gln Trp Thr
      20           25           30
Val Val Ile Leu Ala Leu Asn Ser Lys Leu Ser Phe Lys Glu Ile Glu
      35           40           45
Thr Ile Phe *

```

50 51

<210> 299
 <211> 62
 <212> PRT
 <213> Homo sapiens

<400> 299
 Met Phe Met Pro Gly Thr Val Leu Arg Ile Leu Leu Ala Leu Pro Tyr
 1 5 10 15
 Leu Ile Leu Thr Lys Gln Val Gln Phe Phe Leu Phe Ser Asp Glu Ile
 20 25 30
 Met Ala Trp Lys Val Val Ala Pro Gly Leu Glu Leu Ser Ala Val Thr
 35 40 45
 Pro Asp Ser Thr Leu Phe Asn His Tyr Thr Ile Leu Ser *
 50 55 60 61

<210> 300
 <211> 83
 <212> PRT
 <213> Homo sapiens

<400> 300
 Met Gln Val Lys Phe Ile Leu Lys Tyr Tyr Ile Ser Phe Leu Trp Lys
 1 5 10 15
 Thr Val Thr Ala Asn Gly Glu Thr Val Asn Met Ser Leu Leu Tyr Ile
 20 25 30
 Phe Thr Thr Met Glu Met Arg Lys Lys Ser Glu Val Gly Leu His Leu
 35 40 45
 Pro Ile Ser Ile Leu Lys Pro Phe Phe Thr Ile Val Leu Asp Glu Lys
 50 55 60
 Ile Val Thr Gly Gln Val Trp Gly Gly Glu Leu Phe Leu Leu Phe Cys
 65 70 75 80
 Lys Asp *
 82

<210> 301
 <211> 59
 <212> PRT
 <213> Homo sapiens

<400> 301
 Met Pro Glu Leu Pro Thr Trp Val Leu Ala Leu Leu Pro His Pro Val
 1 5 10 15
 Val Leu Leu Ile Asp Ser Gly Glu Leu Glu Ala Phe Glu Gln Ile Cys
 20 25 30
 Arg Ser Thr Leu Lys Ala Val Trp His Ser Val His Gly Ala Met Ser
 35 40 45
 Val Cys Phe Ile Cys Phe Thr Phe Cys His *
 50 55 58

<210> 302
 <211> 82

<212> PRT

<213> Homo sapiens

<400> 302

```

Met Arg Ile Val Arg Arg Met Cys Met Trp Ser Ala Gly Pro Ala Pro
 1           5           10           15
Ala Thr Val Cys Ala Val Met Val Ala Ala Pro Lys Ser Pro Gln Ser
           20           25           30
Pro Pro Arg Trp Ala Cys Val Tyr Ser Leu Ile Gly Cys His Ser Ser
           35           40           45
Asp Pro Phe Ser Val Tyr Phe Ser Gly Ile Ser Trp Arg Asp Ile Ser
           50           55           60
Leu Ser Leu Tyr Ser Met Ala Gln Glu Ser Gln Asn Gln Ser Ile Leu
65           70           75           80
Lys *
81

```

<210> 303

<211> 83

<212> PRT

<213> Homo sapiens

<400> 303

```

Met Cys Pro Leu Leu Val Tyr Lys Ile Ile Leu Val Phe Ala Ala Met
 1           5           10           15
Phe Phe Phe Ser Gln Gly Ser Gln Val Glu Ile Arg Ser His Glu Gly
           20           25           30
Glu His Cys Val Gly Thr Val His Leu Leu Ser His Phe Leu Tyr Ser
           35           40           45
Lys Asn Asn Pro Val Phe Tyr Lys Gly Asn Thr Ser Phe Ile Phe Glu
50           55           60
Thr Met Glu Glu Asp Ser Leu Ser Ser Leu Ala Glu Arg Ser Gly Ser
65           70           75           80
Cys Met *
82

```

<210> 304

<211> 118

<212> PRT

<213> Homo sapiens

<400> 304

```

Met Pro Gln Phe Pro Val Ala Phe Gly Ile Met Phe Thr Tyr Phe Thr
 1           5           10           15
Leu Ala His Lys Val Leu His Ser Gln Ala Ser Ala Cys Leu Phe Ser
           20           25           30
Ile Ile Cys Phe Phe Pro Thr Cys Thr Leu His Phe Ser Gln Val Gly
           35           40           45
Ser His Ala Ala Pro Trp Met Gly His Asp Ala Leu Cys Leu Arg Val
50           55           60
Phe Leu Tyr Arg Leu Pro Cys Glu Lys Pro Ser Pro Ser Ala His Met
65           70           75           80
Val Thr Gly Ser Val Leu Glu Gly Pro Leu Cys Ala Leu Ala Leu Ser
           85           90           95
Ser Phe Pro Pro Gly Ala Thr Leu His Leu Ser Cys Leu Ser Leu Lys
100           105           110
Arg Ala Val Phe Phe Tyr

```

115

118

<210> 305
 <211> 73
 <212> PRT
 <213> Homo sapiens

<400> 305
 Met Ser Trp Arg Thr Arg Ser Met His Thr His Ile Ser Val Ser Phe
 1 5 10 15
 Lys Gly Lys Ile Arg Pro Thr Ser Ala Tyr Leu Leu Leu Phe Leu Phe
 20 25 30
 Phe Phe Cys Tyr Gly Val Ser Leu Cys Cys Pro Gly Trp Ser Glu Val
 35 40 45
 Val Ala Arg Ser Arg His Leu Ala Ser Ser Ala Ser Arg Val His Ala
 50 55 60
 Ile Leu Leu Pro Gln Asn Pro Glu *
 65 70 72

<210> 306
 <211> 47
 <212> PRT
 <213> Homo sapiens

<400> 306
 Met Leu Ser Thr Leu Ser Ile Gly Thr Leu Ser Met Leu Ile Ile Val
 1 5 10 15
 Val Ser Asp Ser Trp Ser Tyr Ser Ser Asn Ser Pro Ala Met Phe Gly
 20 25 30
 Ser Asp Ala Gly Phe Ile Pro Ser Asn Cys Ile Phe Ala Phe *
 35 40 45 46

<210> 307
 <211> 94
 <212> PRT
 <213> Homo sapiens

<400> 307
 Met Asp Pro Pro Cys Pro Trp Leu His Pro Ala Ala Trp Pro Leu Gln
 1 5 10 15
 Thr Pro Leu Ala Leu Pro Leu Leu Gly Thr Gly Ser Ser Pro Met Pro
 20 25 30
 Ile Phe Arg Trp Arg Pro Pro Val His Leu Leu Ser Met Ala Gln Gly
 35 40 45
 Pro Ser Phe Leu Ala Gly Ala Ala Arg Gly Asp Lys Ala Lys Gly Ala
 50 55 60
 Pro Arg Arg His Gly Ala Asn Phe Ala Leu Thr Arg Trp Ala Tyr Pro
 65 70 75 80
 Ile Arg Ala Leu Asn Leu Leu Gly Gly Arg Gln Thr Trp *
 85 90 93

<210> 308
 <211> 54

<212> PRT
<213> Homo sapiens

<400> 308
Met Ile Leu Val Ser Leu Leu Ile Leu Ile Val Glu Pro Leu Phe Ala
1 5 10 15
Ser Leu Thr Pro Leu Ser Leu Cys Phe Glu Cys Val Val Phe Leu Asn
20 25 30
Val Gly Gln His Leu Thr Asp Gln Thr Phe Ser Leu Asn Gly Leu Leu
35 40 45
Phe Leu Ser Asn Ser *
50 53

<210> 309
<211> 68
<212> PRT
<213> Homo sapiens

<400> 309
Met Ser Pro Leu Leu Pro Leu Ser Tyr Lys Leu Val Leu Cys Phe Pro
1 5 10 15
Thr Pro Asn Gly Val Val Thr His Gly Glu Gln Asn Ala Ser Ser Thr
20 25 30
Asp Ile Glu His Gly Leu Lys Thr Ile Leu Ile Lys Pro Pro Ala Arg
35 40 45
Ile Leu Lys Arg Lys Thr Glu Gly Glu Glu Ser Asn Arg Leu Thr Leu
50 55 60
Pro Thr Thr *
65 67

<210> 310
<211> 87
<212> PRT
<213> Homo sapiens

<400> 310
Met Gly Pro Val Ser Gly Cys Trp His Met Ser Leu Cys Leu Arg Val
1 5 10 15
Tyr Leu Ala Leu Asp Pro Ala His Gln Glu Leu Met Pro Pro Gly Ser
20 25 30
Ser Leu Gln Pro Ile Thr Leu Gly Ile Gly Ile Glu Ile Leu Gln Pro
35 40 45
Pro Thr Leu Glu Val Gly Asn Ser Glu Ala Leu Ser Val Pro Ser Arg
50 55 60
Arg Thr Pro Arg Arg Thr Glu Leu Pro Trp Pro Thr Val Leu Thr Gly
65 70 75 80
Phe Leu Ile Asn Thr Leu *
85 86

<210> 311
<211> 53
<212> PRT
<213> Homo sapiens

<400> 311
 Met Leu Thr Cys Val Pro Glu Arg Leu Phe Gln Cys His His Leu Ile
 1 5 10 15
 Arg Met Thr Cys Leu Phe Met Ile Leu Glu Phe Arg Leu Phe Lys Tyr
 20 25 30
 Asp Ser Asn Leu Cys Ser His Val Ile Ile Asn His Pro Gln Val Gln
 35 40 45
 Gly Arg Gln Arg *
 50 52

<210> 312
 <211> 51
 <212> PRT
 <213> Homo sapiens

<400> 312
 Met Trp Gly Ala Pro Ala Leu Gln Cys Ile Val Phe Phe Arg Trp Thr
 1 5 10 15
 Arg Ser Lys Cys Leu Pro Asp Thr Gly Asn Val Cys Thr Lys Thr Gln
 20 25 30
 Arg Lys Lys Ala Ala Gly Arg Leu Gly Val Ala Gly Gly Ile Ala Leu
 35 40 45
 Gly Leu *
 50

<210> 313
 <211> 61
 <212> PRT
 <213> Homo sapiens

<400> 313
 Met Ser Leu Arg Ile Arg Ala Ala Arg Asn Trp Ala Arg Asp Val Gln
 1 5 10 15
 Lys Leu Trp Thr Ile Val Val Leu Leu Val Leu Ile Leu Ile Arg Ser
 20 25 30
 Ala Val Asn Leu Leu Ile Asn Ser Arg Thr Glu Asp Lys Ser Leu Gln
 35 40 45
 Leu Val Leu Tyr Gln Ser Val Ile Ile Cys Phe Pro *
 50 55 60

<210> 314
 <211> 59
 <212> PRT
 <213> Homo sapiens

<400> 314
 Met Val Trp His Val Arg Lys Ser Ser Phe Val Trp Leu Leu Gln Leu
 1 5 10 15
 Phe Ser Phe Ile Ser Cys His Ser Val Ile Ser Val Ser Pro Val His
 20 25 30
 Val Pro Trp Thr Gln Cys Ala Val Ile Pro Pro Tyr Thr Ser Cys Pro
 35 40 45
 Lys Leu Phe Ala Ile Gln Gly Gly Arg Phe *
 50 55 58

<210> 315
 <211> 81
 <212> PRT
 <213> Homo sapiens

<400> 315
 Met Gly Gly Phe Lys Val Asn Leu Phe Val Lys Val Lys Ala Glu Gly
 1 5 10 15
 Ser Pro Leu Cys Trp Leu Lys Leu Ala Cys Leu Gly Ala Trp Leu Leu
 20 25 30
 Ser Leu Leu Ile Ser Gln Lys Ser Asp Glu Gln Leu Cys Phe Gly Leu
 35 40 45
 Leu Thr Trp Asn Phe Ser Thr Ser Asp Ser Ile Leu Val Trp Phe Val
 50 55 60
 Gly Pro Arg Ala Gly Thr Gln Ser Lys Pro Val Val Ser Tyr Lys Phe
 65 70 75 80
 *

<210> 316
 <211> 52
 <212> PRT
 <213> Homo sapiens

<400> 316
 Met Glu Thr Ser Ser Ala Phe Thr Asn Pro Leu Leu Val Cys Phe Leu
 1 5 10 15
 Ala Leu Leu His Ser Val Met Asn Ile Thr Tyr Thr Pro Pro Lys Lys
 20 25 30
 Lys Asn Glu Asn Cys Ser Lys Pro Leu Ile Leu Thr Ser Ser Leu Gly
 35 40 45
 Thr Val Gln *
 50 51

<210> 317
 <211> 73
 <212> PRT
 <213> Homo sapiens

<400> 317
 Met Cys Ala Phe Leu Leu Pro Phe Lys Leu Leu Phe Phe Leu Glu Ile
 1 5 10 15
 Ser Leu Ala Met Lys Ser His Phe Pro Phe Thr Leu Leu Ile Leu Ser
 20 25 30
 Arg Val Leu Leu Lys Lys Thr Leu Tyr Val Leu Lys Leu Gly Trp Leu
 35 40 45
 Ile Thr Ile Pro Ser Asn Asp Leu Thr Ser Val Phe Thr Leu Met Ile
 50 55 60
 His Arg Gln Asn Gln Lys His Phe *
 65 70 72

<210> 318
 <211> 70

<212> PRT

<213> Homo sapiens

<400> 318

```

Met Pro Thr Leu Leu Gln Val Met Ser Trp Met Leu Ser Phe Gly Thr
 1              5              10              15
Gln Thr Leu Gln Leu Glu Ser Cys Thr Cys Ala Leu His Ile Val Gly
              20              25              30
Ala Trp Lys Val Pro Tyr Pro Leu Phe Ser Arg Val Leu Ile Cys Gln
              35              40              45
Val Lys Ile Leu Ser Thr Ser Ile Ser Gln Glu Lys Val Phe Arg Thr
              50              55              60
Glu Ser Arg Thr Glu *
65              69

```

<210> 319

<211> 46

<212> PRT

<213> Homo sapiens

<400> 319

```

Met Cys Arg Ala Leu Leu Leu Leu Cys Ser Pro Asn Ser Ser Phe
 1              5              10              15
Gln Trp Leu Pro Leu Pro Val His Pro His Thr Thr Ile Arg Tyr Arg
              20              25              30
Ser Tyr Asn Met Val Pro Val Lys Leu Thr Asn Val Gln *
              35              40              45

```

<210> 320

<211> 56

<212> PRT

<213> Homo sapiens

<400> 320

```

Met Leu Phe Leu His Ile Ala Glu Cys Ser Phe Leu Arg Leu Lys Val
 1              5              10              15
Ala Phe Pro Ser Ser Leu Asn Phe Gln Pro Leu Ala Gln Phe Leu Ala
              20              25              30
His Ile Leu Glu Val Phe Tyr Lys Cys Leu Trp Lys Lys Gly Val Gln
              35              40              45
Val Phe Asn Phe Leu Ala Asn *
50              55

```

<210> 321

<211> 58

<212> PRT

<213> Homo sapiens

<400> 321

```

Met Pro Leu Asp Thr Asp Ala Ile Leu His Arg Thr Ala Glu Trp Tyr
 1              5              10              15
Val Leu Cys Leu Ile Thr Cys Ile Phe Met Tyr Val Leu Tyr Val Pro
              20              25              30
Tyr Leu Arg Ser Leu Ile Leu Leu Glu Tyr Leu His Leu Leu Pro Phe

```

```
<210> 322
<211> 50
<212> PRT
<213> Homo sapiens
```

```
<210> 323
<211> 53
<212> PRT
<213> Homo sapiens
```

```
<210> 324
<211> 75
<212> PRT
<213> Homo sapiens
```

<210> 325
<211> 61

<212> PRT
 <213> Homo sapiens

<400> 325
 Met Phe Cys Leu Trp Asn Gln Trp Val Val Thr Ala Gln Arg Leu Leu
 1 5 10 15
 Val Ser Trp Leu Ser His Ala Gln Arg Gln Pro Cys Pro Leu Ser Leu
 20 25 30
 Phe Cys Gly Arg Arg Asn Pro Leu Ala Trp Thr Ile Phe Gly Trp Lys
 35 40 45
 His Gln Pro Leu Thr Ser Asp Cys His Phe Gln Met *
 50 55 60

<210> 326
 <211> 59
 <212> PRT
 <213> Homo sapiens

<400> 326
 Met Thr Thr Ser Ser Leu Val Leu Pro Pro Leu Phe Val Leu Lys Cys
 1 5 10 15
 Gln Arg Phe Tyr Pro Pro Leu Tyr Leu His Pro Tyr Ser Ile Cys Gln
 20 25 30
 His Val Ser Ile Leu Val Lys Ile Val Trp Thr Trp Gly Ser Glu Val
 35 40 45
 Pro Thr Leu Gly Thr Ile Glu Ile Gly Thr *
 50 55 58

<210> 327
 <211> 73
 <212> PRT
 <213> Homo sapiens

<400> 327
 Met Leu Ala Trp Arg Leu Leu Cys Pro Trp Gly Pro Gly Leu Pro Thr
 1 5 10 15
 Thr Thr Ala Arg Ser Gly Glu Arg Thr Glu Arg Arg Glu Arg Val Arg
 20 25 30
 Thr Ala Ser Pro Arg Lys Ile Leu Phe Lys Thr Gln Pro Pro Arg Gly
 35 40 45
 Ser Ser Thr Asp Arg Cys Pro Trp Gly Arg Gln Cys Leu His Gly Thr
 50 55 60
 Gly Thr Cys His Met Pro Asn Arg *
 65 70 72

<210> 328
 <211> 47
 <212> PRT
 <213> Homo sapiens

<221> misc_feature
 <222> (1)...(47)
 <223> Xaa = any amino acid or nothing

<400> 328

```

Met Thr Ser Arg Pro His Phe Phe Arg Tyr Leu Cys Ser Leu Pro Pro
 1          5          10          15
Leu Leu Phe Pro Leu Leu Xaa Gln Ser Gln Leu Leu Pro Gly Ser Pro
          20          25          30
Leu Pro Ile Ala Leu Gln Ser Arg Val Gly Ser Leu Leu Ala *
          35          40          45 46

```

<210> 329

<211> 96

<212> PRT

<213> Homo sapiens

<400> 329

```

Met Leu Pro Ser Phe Leu Pro Gln Ser Leu Gly Asn Leu Ile His Thr
 1          5          10          15
Leu Gly Phe Leu Leu Ile Ile His Lys Tyr Met Ser Ala Phe Lys Asn
          20          25          30
Arg Thr Asp Glu Phe Met Asn Met Gly Met Gln Pro Tyr Ile Lys Ser
          35          40          45
Pro Tyr Arg Leu Ser Met Ser Gln Ile Ser Leu Lys Phe Asp Leu Ser
          50          55          60
Gln Thr Asp Leu Ile Leu Pro His Lys Phe Tyr Ser Pro Ser Ser Phe
          65          70          75          80
Pro Thr Val Met Leu Phe Tyr Ser Phe Gly Arg Leu Ser His Lys Pro
          85          90          95 96

```

<210> 330

<211> 50

<212> PRT

<213> Homo sapiens

<400> 330

```

Met Gln Ala Trp Arg Ser Phe Val Met Gly Val Glu Val Leu Met Tyr
 1          5          10          15
Ile Val Ala Val Arg Cys Arg Ala Val Phe Ala Thr Ser Leu Trp Gln
          20          25          30
Pro Trp Cys Tyr Thr Arg Ala Gly Gly Gln Phe Asn Val Ser Gln Ala
          35          40          45
Arg *
49

```

<210> 331

<211> 78

<212> PRT

<213> Homo sapiens

<400> 331

```

Met Val Val Leu Tyr Ile Val Arg Ala Tyr Asn His Tyr Ile Leu Cys
 1          5          10          15
Cys Leu Ser Ser Ser Leu Tyr Leu Val Phe Ile Leu Leu Val Thr Val
          20          25          30
Tyr Leu Met Leu Thr Thr Ser Ser Tyr Asn Asp Val Ser Leu Val Ile

```

```

          35          40          45
Trp Ile Ala Ser Ser Phe Ala Ser Ser Lys Phe Phe Arg Lys Gly Leu
  50          55          60
Arg Glu Tyr Ser Tyr Phe Met Asn Phe Leu Ala Arg Ser *
  65          70          75          77

```

<210> 332
 <211> 93
 <212> PRT
 <213> Homo sapiens

```

          <400> 332
Met Leu Glu Trp Pro Leu Leu Gly Gln Ile Leu Pro Met Ile Ile Pro
  1          5          10          15
Leu Pro Pro Leu Pro Ala Leu Val Val Trp Pro Ile Gly Leu Thr His
          20          25          30
Cys Pro Trp Pro Ser Pro Phe Val Pro Ala Ser Leu Asp Gly Phe Tyr
          35          40          45
Asn Ser Arg Ser Leu Asp Gly Lys Ser Pro Pro Leu Arg Pro Glu Lys
          50          55          60
Trp Ser Pro Trp Ser Trp Phe Ser Arg Leu Pro Gly His Gly Leu Pro
          65          70          75          80
Lys Glu Gly Gly Gln Arg Lys Arg Glu Val Trp Ala *
          85          90          92

```

<210> 333
 <211> 66
 <212> PRT
 <213> Homo sapiens

```

          <400> 333
Met Met Leu Trp Gln Val Tyr Pro Gly Pro Ser Ala Ala Val Leu Cys
  1          5          10          15
Leu Phe Leu His Pro Pro Trp Ser Arg Ser Thr Ala Val Glu Arg Glu
          20          25          30
Lys Arg Gln Lys Asp Gly Arg Gly Gln Arg Met Leu Leu Pro Gln Pro
          35          40          45
Gln Cys Leu Met Ser Ser Cys Cys Leu Val Asp Val Gln Ser Leu Thr
          50          55          60
Gly *
  65

```

<210> 334
 <211> 61
 <212> PRT
 <213> Homo sapiens

```

          <400> 334
Met Phe Phe Cys Leu Thr Arg Gln Ser Leu Leu Cys Thr Leu Leu Leu
  1          5          10          15
Met Leu Lys Arg Cys Ile Phe Phe Ser Tyr Cys Val Ile Cys Arg Ala
          20          25          30
Lys Ser Phe Glu Leu Phe Thr Ser Glu Ile Thr Phe Pro Asp Lys Arg
          35          40          45
Ala Lys Gln Cys Leu Phe Lys Leu Phe Ser Gly Thr *

```

50

55

60

<210> 335
 <211> 53
 <212> PRT
 <213> Homo sapiens

<400> 335
 Met Gly Asn Thr Asp Ile Leu Leu Leu Leu Ser Leu Phe Cys Phe Ser
 1 5 10 15
 Tyr Glu Leu Val Ala Gly Lys Thr Lys Ala Gln Phe Gly Val Pro Phe
 20 25 30
 Ala Glu Phe Ser Val Phe Leu Ile Leu Glu Asn Val Thr Ala Cys Arg
 35 40 45
 Phe Leu Tyr Ile *
 50 52

<210> 336
 <211> 69
 <212> PRT
 <213> Homo sapiens

<400> 336
 Met Ser Ile Leu Val Val Ser Ala Phe Leu Ala Asn Leu Trp Leu Leu
 1 5 10 15
 Met Thr Ile Ser Thr Ser Gln Met Leu Asn Met Thr Lys Ile Thr Tyr
 20 25 30
 Leu Val Leu Phe Leu His Leu Ser Ala Leu Arg Ile Gly Ser Thr Pro
 35 40 45
 His Ser Phe Leu Leu Lys Ser Tyr His Leu Gly Thr His Phe Ser Leu
 50 55 60
 Phe His Met Asn Ser
 65 69

<210> 337
 <211> 79
 <212> PRT
 <213> Homo sapiens

<400> 337
 Met Phe Val Phe Val Ser Ile His Thr Glu Leu Val Pro Ile Leu Arg
 1 5 10 15
 Pro Leu Cys Leu Leu Tyr Cys Cys Pro Asp Cys Ser Val Pro Arg Pro
 20 25 30
 Leu Tyr Ser Leu Lys Tyr Leu Leu Leu Ile Asn Asp Phe Pro Glu Leu
 35 40 45
 Gln Ile His Met Ser Ser Phe Ser Gln Ser Leu His Tyr Ile Ile Leu
 50 55 60
 Ser Tyr Phe Phe His Ser Ile Cys His Ile Leu Leu Val Leu *
 65 70 75 78

<210> 338
 <211> 53

<212> PRT
<213> Homo sapiens

<400> 338
Met Met Arg Val Ile Ile Leu Ile Trp Phe Arg Ile Ser Lys Gly Thr
1 5 10 15
Phe Gln His Ser Thr Thr Lys Cys Asp Val Cys Phe Arg Val Phe Leu
20 25 30
Leu Ser Asn Cys Ser Phe Leu Ser Leu Asn Tyr Lys Leu Thr Ser Asp
35 40 45
Phe Ile Ile Tyr *
50 52

<210> 339
<211> 63
<212> PRT
<213> Homo sapiens

<400> 339
Met Gln Met Val Val Pro Arg Leu Leu Ser Val Pro Gln Leu Leu Asn
1 5 10 15
Thr Ala Pro Leu Phe Leu Pro Trp Glu Lys Thr Val Lys Thr Gln Tyr
20 25 30
Ser Gly Ile Ile Phe Lys Phe Lys Ser Arg Ile Glu Thr Ala Glu Lys
35 40 45
Ser Ile Gly Asp Thr Lys Glu Arg Ile Gln Pro Ser Gln Ile *
50 55 60 62

<210> 340
<211> 60
<212> PRT
<213> Homo sapiens

<400> 340
Met Leu Leu Pro Val Phe Leu Leu Tyr Leu Ser Gln Asp Leu Ala Asp
1 5 10 15
Ser Arg Ala Pro Ala His Cys Ser Val Asn Thr Asp Leu His Leu Lys
20 25 30
Trp Gly Ser Leu Cys Val Leu Ser His Phe Gln Val Asp Leu Pro Val
35 40 45
Asn Pro Ile Cys Glu His Ile Cys Arg Cys Pro *
50 55 59

<210> 341
<211> 46
<212> PRT
<213> Homo sapiens

<400> 341
Met Asn Leu Glu His Val Ile Val Ser Leu Leu Thr Phe Tyr Arg Val
1 5 10 15
Leu Leu Tyr Lys Glu Ile Ile Gly Leu His His Cys Phe Gln His Phe
20 25 30
His Val Asn Ala Phe Leu Leu Ser Pro Leu Pro Pro Ser *

35

40

45

<210> 342
 <211> 48
 <212> PRT
 <213> Homo sapiens

<400> 342
 Met Ser Ala Leu Trp Leu Val Tyr Val Ser Cys Gly Cys Ser Cys Ala
 1 5 10 15
 Leu Cys Val Leu Val His Ala Gln Thr Cys Thr Ser Phe Ser Ile Leu
 20 25 30
 Val His Ala Gln Ala His Val Leu Ser Cys Asp His Ile His Thr Ser
 35 40 45 48

<210> 343
 <211> 51
 <212> PRT
 <213> Homo sapiens

<400> 343
 Met Leu Ile Gln Phe Thr Phe Phe Phe Pro Ile Ser Gln Arg Phe Trp
 1 5 10 15
 Phe Cys Leu Leu Phe Phe Phe Pro Gln Thr Phe Lys Cys Met Lys Phe
 20 25 30
 Tyr Ser Leu Ile Glu Val Arg Glu Gly Val Cys Ile His Gln Arg Ser
 35 40 45
 Gln Phe Val
 50 51

<210> 344
 <211> 93
 <212> PRT
 <213> Homo sapiens

<400> 344
 Met Ile Glu Leu Ala Trp Lys Phe Ile Met His Ile Asn Ala Leu Leu
 1 5 10 15
 Ser Phe Gly Thr Thr Ser Leu Lys Ile Lys Phe Ala His Val Phe Ser
 20 25 30
 Phe Leu Gln Leu Cys Ile Met Asn Lys Ile Thr Leu Ile Ser Leu Asn
 35 40 45
 Thr Pro Pro Phe Gln Glu Glu Phe Thr Glu Leu Gly Ser Phe Val Asn
 50 55 60
 His Cys Glu Leu Ile Asn Lys Asn Leu Ser His Asn Leu Pro Phe Phe
 65 70 75 80
 Pro Trp Leu Ile Ile Leu Leu Lys Val Ile Arg Tyr *
 85 90 92

<210> 345
 <211> 70

<212> PRT

<213> Homo sapiens

<400> 345

```

Met Pro Asn Arg Ile Glu Leu Ser Ala Leu Phe Arg Val Pro Phe His
 1           5           10           15
Val Asp Trp Leu Leu Phe Ala Phe Val Phe Phe Pro Leu Cys Tyr Val
           20           25           30
Leu Gly Phe Cys Leu Pro Ser Thr Val Lys Thr His Ser Leu Ile Val
           35           40           45
Gly Ala Val Phe Gln Ser Glu Ile Val Thr Asn Val Cys Gln Ile Tyr
 50           55           60
Lys Cys Lys Thr Thr *
65           69

```

<210> 346

<211> 75

<212> PRT

<213> Homo sapiens

<400> 346

```

Met Arg Ala His Pro His Thr Pro Arg Ser Ala Ala His Ile Ile Leu
 1           5           10           15
Ser Thr Trp Leu Ala Leu Gly Pro Tyr Leu Tyr Arg Thr Arg Asn Cys
           20           25           30
Gly Pro Leu Thr Glu Glu Pro Ser Leu Ala Pro Ser Thr Gln Gly Ala
           35           40           45
Arg Arg Thr Asn Thr Thr Pro Glu Leu Ala Ala Arg Pro Val Ala Pro
 50           55           60
Cys Leu His Ile Ser Tyr Thr Phe Thr Arg Gly
65           70           75

```

<210> 347

<211> 72

<212> PRT

<213> Homo sapiens

<400> 347

```

Met Pro Leu Leu Tyr Ile Ile Cys Leu Arg Gln Leu Val Leu Phe His
 1           5           10           15
Ser Lys Cys His Ser Gln His Ser Cys Arg Ala Gly Gly Ile Gln Tyr
           20           25           30
Ser Met His Val Ser Leu Phe Leu Ser Ser Pro Ile Asn Tyr Asp Asn
           35           40           45
Gly Phe Leu Val Ser Pro Thr Phe Pro Leu His Val Lys Leu Ser Phe
 50           55           60
Leu Lys Tyr Ser Phe Lys Cys Ile
65           70           72

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<210> 348

<211> 60

<212> PRT

<213> Homo sapiens

<400> 349	
atcatgatgc atatacctat ctattcgatg atgaagatac cccaccaaac ccaaaaaaag	60
agatctctcg aggatccgaa ttccgggccc cgtcgactgc actattaagt agacc atg	118
	Met
	1
tct ccc ctt ctc cca ctg tcc tat aaa ttg gtc ctg tgt ttc cca acc	166
Ser Pro Leu Leu Pro Leu Ser Tyr Lys Leu Val Leu Cys Phe Pro Thr	
5 10 15	
cca aat ggg gta gta act cat gga gaa caa aat gcc agt agt aca gat	214
Pro Asn Gly Val Val Thr His Gly Glu Gln Asn Ala Ser Ser Thr Asp	
20 25 30	
ata gaa cat ggg tta aaa act att ctg atc aaa ccc cca gca aga atc	262
Ile Glu His Gly Leu Lys Thr Ile Leu Ile Lys Pro Pro Ala Arg Ile	
35 40 45	
ttg aag agg aag aca gag ggg gaa gaa agc aat agg ctt act ctc cct	310
Leu Lys Arg Lys Thr Glu Gly Glu Glu Ser Asn Arg Leu Thr Leu Pro	
50 55 60 65	
aca act taa ttccatg ctctaattca gagcagtata attaaccccg agtttccactg	366
Thr Thr *	
ctaactga agtttttcag cctgatgaga atatcattta gtatcctgca atcgccaata	426
atagcaatat gacacaatgg tgcccattga ggctctaata agagcacata gtcatttaca	486
tagaacattt tctgtgactc tctgtaatac aacgccacaa agactcaatt gagacacaag	546
tctccctttc ccataancta nnnaaaaaaaa aaaaccaaga aaaaagggggg gggggggggg	606
aaaaqqaaaa gaggqacccc cctttttttt ttcaaqqaga ccaaaatggt tccccaccat	666


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cccagccact taactgtttt ttaaacaac atgaacttaa aattatatca aacagaccat      802
tattgcgcgc gtctacagac ccagcttact agcgggctgc acgcatagtc ttctttacgt      862
cactaaatca atcccggccg ccgtttacac agcggactgg aaccccccg ctcaaaaaac      922
gaattctatc ggggctagcc cgctccgttc ttacaaaacg aatccccccc ccgcgctgcg      982
ccggcaggag ccataccgac ctgcatatcc gggccccccc ggctcggctc cggaccaacc     1042
cttgcttgag cggccccgcg ggccgtctac tccggtaaaa ctcatcaccc ccgcctgcc      1102
cgctctggcc gggtagacc                                     1122

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<210> 351
<211> 1282
<212> DNA
<213> Homo sapiens

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<220>
<221> CDS
<222> (133) .. (1161)

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<400> 351
taccggtccg gaattcccgc gtcgacgatt tcgtgcagga agtgactgcg ggagtggagc      60
cggcgagaga gtggcagcgc gggctgatgg aagtgcagtg ggggctggag agggcacccct     120
actgtatcca gc      atg ctc caa ggc cac agc tct gtg ttc cag gcc ttg      168
                  Met Leu Gln Gly His Ser Ser Val Phe Gln Ala Leu
                   1                      5                      10
ctg ggg acc ttc ttc acc tgg ggg atg aca gca gct ggg gca gct ctc      216
Leu Gly Thr Phe Phe Thr Trp Gly Met Thr Ala Ala Gly Ala Ala Leu
                   15                      20                      25
gtg ttc gta ttc tct agt gga cag agg cgg atc tta gat gga agt ctt      264
Val Phe Val Phe Ser Ser Gly Gln Arg Arg Ile Leu Asp Gly Ser Leu
                   30                      35                      40
ggc ttt gct gca ggg gtc atg ttg gca gct tcc tat tgg tct ctt ctg      312
Gly Phe Ala Ala Gly Val Met Leu Ala Ala Ser Tyr Trp Ser Leu Leu
                   45                      50                      55                      60
gcc cca gca gtt gag atg gcc acg tcc tct ggg ggc ttc ggt gcc ttt      360
Ala Pro Ala Val Glu Met Ala Thr Ser Ser Gly Gly Phe Gly Ala Phe
                   65                      70                      75
gcc ttc ttc cct gtg gct gtt ggc ttc acc ctt gga gcg gct ttt gtc      408
Ala Phe Phe Pro Val Ala Val Gly Phe Thr Leu Gly Ala Ala Phe Val
                   80                      85                      90
tac ttg gct gac ctc ctg atg cct cac ttg ggt gca gca gaa gac ccc      456
Tyr Leu Ala Asp Leu Leu Met Pro His Leu Gly Ala Ala Glu Asp Pro
                   95                      100                      105
cag acg gcc ctg gca ctg aac ttc ggc tct acg ttg atg aag aag aag      504
Gln Thr Ala Leu Ala Leu Asn Phe Gly Ser Thr Leu Met Lys Lys Lys
                   110                      115                      120
tct gat cct gag ggt ccc gcg ctg ctc ttc cct gag agt gaa ctt tcc      552

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Ser Asp Pro Glu Gly Pro Ala Leu Leu Phe Pro Glu Ser Glu Leu Ser	
125 130 135 140	
atc cgg ata ggt aga gct ggg ctt ctt tca gac aag agt gag aat ggt	600
Ile Arg Ile Gly Arg Ala Gly Leu Leu Ser Asp Lys Ser Glu Asn Gly	
145 150 155	
gag gca tat cag aga aag aag gcg gca gcc act ggc ctt cca gag ggt	648
Glu Ala Tyr Gln Arg Lys Lys Ala Ala Ala Thr Gly Leu Pro Glu Gly	
160 165 170	
cct gct gtc cct gtg cct tct cga ggg aat ctg gca cag ccc ggc ggc	696
Pro Ala Val Pro Val Pro Ser Arg Gly Asn Leu Ala Gln Pro Gly Gly	
175 180 185	
agc agc tgg agg agg atc gca ctg ctc atc ttg gcc atc act ata cac	744
Ser Ser Trp Arg Arg Ile Ala Leu Leu Ile Leu Ala Ile Thr Ile His	
190 195 200	
aac gtt cca aag ggt ctc gct gtt gga gtt gga ttt ggg gct ata gaa	792
Asn Val Pro Lys Gly Leu Ala Val Gly Val Gly Phe Gly Ala Ile Glu	
205 210 215 220	
aag acg gca tct gct acc ttt gag agt gcc agg aat ttg gcc att gga	840
Lys Thr Ala Ser Ala Thr Phe Glu Ser Ala Arg Asn Leu Ala Ile Gly	
225 230 235	
atc ggg atc cag aat ttc ccc gag ggc ctg gct gtc agc ctt ccc ttg	888
Ile Gly Ile Gln Asn Phe Pro Glu Gly Leu Ala Val Ser Leu Pro Leu	
240 245 250	
cga ggg gca ggc ttc tcc acc tgg aga gct ttc tgg tat ggg cag ctg	936
Arg Gly Ala Gly Phe Ser Thr Trp Arg Ala Phe Trp Tyr Gly Gln Leu	
255 260 265	
agc ggc atg gtg gag ccc ctg gcc ggg gtc ttt ggt gcc ttt gcc gtg	984
Ser Gly Met Val Glu Pro Leu Ala Gly Val Phe Gly Ala Phe Ala Val	
270 275 280	
gtg ctg gct gag ccc atc ctg ccc tac gct ctg gcc ttt gct gcc ggt	1032
Val Leu Ala Glu Pro Ile Leu Pro Tyr Ala Leu Ala Phe Ala Ala Gly	
285 290 295 300	
gcc atg gtc tac gtg gtc atg gac gac atc atc ccc gaa gcc cag atc	1080
Ala Met Val Tyr Val Val Met Asp Asp Ile Ile Pro Glu Ala Gln Ile	
305 310 315	
agt ggt aat ggg aaa ctg gca tcc tgg gcc tcc atc ctg gga ttt gta	1128
Ser Gly Asn Gly Lys Leu Ala Ser Trp Ala Ser Ile Leu Gly Phe Val	
320 325 330	
gtg atg atg tca ctg gac gtt ggc ctg ggc tag ggctgaga cgcttcggac	1179
Val Met Met Ser Leu Asp Val Gly Leu Gly *	
335 340	
cccgggaaag gccatacgaa gaaacagcag tggttggtt ctatgggaca acaagcttct	1239
ttcttcacat taaaactttt ttcttctctc tcttcttcat ctc	1282

<210> 352

<211> 942

<212> DNA
 <213> Homo sapiens
 <220>
 <221> CDS
 <222> (389)..(835)

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<400> 352
taccggtccg gaattcccgg gtcgacgatt tcgttttatac acttcacagc tctcaaccaa      60
cagggggcct tctttatcct atttaacctc tcagtagagt atttgccctt tgcttattcc      120
tctttccagt caactcttga ttattcatgt aatagaggaa agcattaatg tgaatgatag      180
aagactgcc cacccttgcc tctcttctct gccacagcag catccagtca cagaaatgga      240
aacaactagc aggagagctt ctgagtgtag cctttgatgg gcctgatgct gggtaactat      300
gtgcagcctc caacttggtc ccttacctaa gatctttctc ctggcctgcc ctccatgtcg      360
gggagctatc gtcgtcttca agctacag  atg cac atg ttg aat gga gct ctt      412
                               Met His Met Leu Asn Gly Ala Leu
                               1                               5

ctg gca ttg ctg ttt cct gtg gta aac act cgg ctg ctc ccc ttt gaa      460
Leu Ala Leu Leu Phe Pro Val Val Asn Thr Arg Leu Leu Pro Phe Glu
   10                               15                               20

ttg gag att tac tac att cag cat gtt atg ctc tac gtg gta ccc atc      508
Leu Glu Ile Tyr Tyr Ile Gln His Val Met Leu Tyr Val Val Pro Ile
   25                               30                               35                               40

tac ctg ctt tgg aaa gga ggt gct tac act cca gag ccc ctc agc agt      556
Tyr Leu Leu Trp Lys Gly Gly Ala Tyr Thr Pro Glu Pro Leu Ser Ser
           45                               50                               55

ttc cgg tgg gct ctt ctc tca act ggc ctc atg ttc ttt tat cac ttc      604
Phe Arg Trp Ala Leu Leu Ser Thr Gly Leu Met Phe Phe Tyr His Phe
           60                               65                               70

agc gtc ttg cag atc ctc ggc ctg gtc acc gaa gtg aat ttg aac aac      652
Ser Val Leu Gln Ile Leu Gly Leu Val Thr Glu Val Asn Leu Asn Asn
           75                               80                               85

atg ctg tgt ccg gcc atc tca gac cca ttc tac ggc ccc tgg tat cgc      700
Met Leu Cys Pro Ala Ile Ser Asp Pro Phe Tyr Gly Pro Trp Tyr Arg
           90                               95                               100

atc tgg gcc tcg gga cac cag act ctc atg acc atg acc cac ggg aag      748
Ile Trp Ala Ser Gly His Gln Thr Leu Met Thr Met Thr His Gly Lys
   105                               110                               115                               120

ctg gtc atc ctg ttt tca tac atg gct ggg ccc ttg tgt aaa tat ctg      796
Leu Val Ile Leu Phe Ser Tyr Met Ala Gly Pro Leu Cys Lys Tyr Leu
           125                               130                               135

ctg gat ttg ctc cgg ctt cca gcc aag aaa ata gac tga aggtgcttat      845
Leu Asp Leu Leu Arg Leu Pro Ala Lys Lys Ile Asp  *
           140                               145

tttttttttt tttctccct gaggaagcaa gtcgtgactt gacttggaga acaccagtt      905

cttgataaaa tcatgggaga gggcaaaaaa aaaaaaa      942

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<210> 353
 <211> 1123
 <212> DNA
 <213> Homo sapiens

<220>
 <221> CDS
 <222> (536) .. (1066)

<400> 353
 aaggatcctt aattaaatta atcccccccc cccggggcac cgcgaagcca gcgtgctcag 60
 cattcagga ggcagcggcg ctgccttca tccaggacaa caaaactgcc atttccgaag 120
 agaaaggaaa cggctcgcgg tttctggggt tcccaagcgc gcgcctgcga gggaggccgc 180
 gagccgagtc gccacgcca gaaccccgag cccgcccccg cgccaccag cccggccccg 240
 ccgccccggc tgccacgcg acgccccctc gagggccgc tctgcgccc tatttggtca 300
 ttcggggggc aagcggcggg aggggaaacg tgccgggccg aaggggaagc ggagccggcg 360
 ccggctgcgc agaggagccg ctctcgccgc cgccacctcg gctgggagcc cagcaggctg 420
 ccgcacctcg ccctcggaac aatgggactc ggccgcgcgag gtgcttgccg ccgcgctgct 480
 cctggggagc ctgcaggtgc tagcgtgctt gggggccgcc catgaaagcg cagcc atg 538
 Met
 1
 gcg gca tct gca aac ata gag aat tct ggg ctt cca cac aac tcc agt 586
 Ala Ala Ser Ala Asn Ile Glu Asn Ser Gly Leu Pro His Asn Ser Ser
 5 10 15
 gct aac tca aca gag act ctc caa cat gtg cct tct gac cat aca aat 634
 Ala Asn Ser Thr Glu Thr Leu Gln His Val Pro Ser Asp His Thr Asn
 20 25 30
 gaa act tcc aac agt act gtg aaa cca cca act tca gtt gcc tca gac 682
 Glu Thr Ser Asn Ser Thr Val Lys Pro Pro Thr Ser Val Ala Ser Asp
 35 40 45
 tcc agt aat aca acg gtc acc acc atg aaa cct aca gcg gca tct aat 730
 Ser Ser Asn Thr Thr Val Thr Thr Met Lys Pro Thr Ala Ala Ser Asn
 50 55 60 65
 aca aca aca cca ggg atg gtc tca aca aat atg act tct acc acc tta 778
 Thr Thr Thr Pro Gly Met Val Ser Thr Asn Met Thr Ser Thr Thr Leu
 70 75 80
 aag tct aca ccc aaa aca aca agt gtt tca cag aac aca tct cag ata 826
 Lys Ser Thr Pro Lys Thr Thr Ser Val Ser Gln Asn Thr Ser Gln Ile
 85 90 95
 tca aca tcc aca atg acc gta acc cac aat agt tca gtg aca tct gct 874
 Ser Thr Ser Thr Met Thr Val Thr His Asn Ser Ser Val Thr Ser Ala
 100 105 110
 gct tca tca gta aca atc aca aca act atg cat tct gaa gca aag aaa 922
 Ala Ser Ser Val Thr Ile Thr Thr Thr Met His Ser Glu Ala Lys Lys
 115 120 125

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gga tca aaa ttt gat act ggg agc ttt gtt ggt ggt att gta tta acg      970
Gly Ser Lys Phe Asp Thr Gly Ser Phe Val Gly Gly Ile Val Leu Thr
130                               135                               140                               145

ctg gga gtt tta tct att ctt tac att gga tgc aaa atg tat tac tca      1018
Leu Gly Val Leu Ser Ile Leu Tyr Ile Gly Cys Lys Met Tyr Tyr Ser
                               150                               155                               160

aga aga ggc att cgg tat cga acc ata gat gaa cat gat gcc atc att      1066
Arg Arg Gly Ile Arg Tyr Arg Thr Ile Asp Glu His Asp Ala Ile Ile
                               165                               170                               175

taaggaaatc catggaccaa ggatggaata cagattgatg ctgccctatc aattaat      1123

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<210> 354
<211> 68
<212> PRT
<213> Homo sapiens

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<400> 354
Met Ser Pro Leu Leu Pro Leu Ser Tyr Lys Leu Val Leu Cys Phe Pro
 1                               5                               10                               15
Thr Pro Asn Gly Val Val Thr His Gly Glu Gln Asn Ala Ser Ser Thr
                               20                               25                               30
Asp Ile Glu His Gly Leu Lys Thr Ile Leu Ile Lys Pro Pro Ala Arg
                               35                               40                               45
Ile Leu Lys Arg Lys Thr Glu Gly Glu Glu Ser Asn Arg Leu Thr Leu
                               50                               55                               60
Pro Thr Thr *
65                               67

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<210> 355
<211> 124
<212> PRT
<213> Homo sapiens

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<400> 355
Met Arg Pro Leu Pro Phe Pro Thr Lys Tyr Leu Gly Lys Phe Ser Trp
 1                               5                               10                               15
Lys Trp Phe Phe Leu Ser Leu Asn Ala Gly Asp Tyr His Arg Glu Phe
                               20                               25                               30
Ser Thr Val Tyr Phe Glu Phe Glu Ser Phe Gly His Trp Ser Phe Leu
                               35                               40                               45
Gln Cys Phe Met Ser Trp Arg Thr Arg Ser Met His Thr His Ile Ser
                               50                               55                               60
Val Ser Phe Lys Gly Lys Ile Arg Pro Thr Ser Ala Tyr Leu Leu Leu
65                               70                               75                               80
Phe Leu Phe Phe Phe Cys Tyr Gly Val Ser Leu Cys Cys Pro Gly Trp
                               85                               90                               95
Ser Glu Val Val Ala Arg Ser Arg His Leu Ala Ser Ser Ala Ser Arg
                               100                              105                              110
Val His Ala Ile Leu Leu Pro Gln Asn Pro Glu *
                               115                              120                              123

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<210> 356
<211> 343
<212> PRT
<213> Homo sapiens

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<400> 356

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Met Leu Gln Gly His Ser Ser Val Phe Gln Ala Leu Leu Gly Thr Phe
 1      5      10      15
Phe Thr Trp Gly Met Thr Ala Ala Gly Ala Ala Leu Val Phe Val Phe
 20      25      30
Ser Ser Gly Gln Arg Arg Ile Leu Asp Gly Ser Leu Gly Phe Ala Ala
 35      40      45
Gly Val Met Leu Ala Ala Ser Tyr Trp Ser Leu Leu Ala Pro Ala Val
 50      55      60
Glu Met Ala Thr Ser Ser Gly Gly Phe Gly Ala Phe Ala Phe Phe Pro
 65      70      75      80
Val Ala Val Gly Phe Thr Leu Gly Ala Ala Phe Val Tyr Leu Ala Asp
 85      90      95
Leu Leu Met Pro His Leu Gly Ala Ala Glu Asp Pro Gln Thr Ala Leu
100      105      110
Ala Leu Asn Phe Gly Ser Thr Leu Met Lys Lys Lys Ser Asp Pro Glu
115      120      125
Gly Pro Ala Leu Leu Phe Pro Glu Ser Glu Leu Ser Ile Arg Ile Gly
130      135      140
Arg Ala Gly Leu Leu Ser Asp Lys Ser Glu Asn Gly Glu Ala Tyr Gln
145      150      155      160
Arg Lys Lys Ala Ala Ala Thr Gly Leu Pro Glu Gly Pro Ala Val Pro
165      170      175
Val Pro Ser Arg Gly Asn Leu Ala Gln Pro Gly Gly Ser Ser Trp Arg
180      185      190
Arg Ile Ala Leu Leu Ile Leu Ala Ile Thr Ile His Asn Val Pro Lys
195      200      205
Gly Leu Ala Val Gly Val Gly Phe Gly Ala Ile Glu Lys Thr Ala Ser
210      215      220
Ala Thr Phe Glu Ser Ala Arg Asn Leu Ala Ile Gly Ile Gly Ile Gln
225      230      235      240
Asn Phe Pro Glu Gly Leu Ala Val Ser Leu Pro Leu Arg Gly Ala Gly
245      250      255
Phe Ser Thr Trp Arg Ala Phe Trp Tyr Gly Gln Leu Ser Gly Met Val
260      265      270
Glu Pro Leu Ala Gly Val Phe Gly Ala Phe Ala Val Val Leu Ala Glu
275      280      285
Pro Ile Leu Pro Tyr Ala Leu Ala Phe Ala Ala Gly Ala Met Val Tyr
290      295      300
Val Val Met Asp Asp Ile Ile Pro Glu Ala Gln Ile Ser Gly Asn Gly
305      310      315      320
Lys Leu Ala Ser Trp Ala Ser Ile Leu Gly Phe Val Val Met Met Ser
325      330      335
Leu Asp Val Gly Leu Gly *
340      342

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<210> 357

<211> 149

<212> PRT

<213> Homo sapiens

<400> 357

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Met His Met Leu Asn Gly Ala Leu Leu Ala Leu Leu Phe Pro Val Val
 1      5      10      15
Asn Thr Arg Leu Leu Pro Phe Glu Leu Ile Tyr Tyr Ile Gln His
 20      25      30
Val Met Leu Tyr Val Val Pro Ile Tyr Leu Leu Trp Lys Gly Gly Ala
 35      40      45
Tyr Thr Pro Glu Pro Leu Ser Ser Phe Arg Trp Ala Leu Leu Ser Thr
 50      55      60

```

Gly Leu Met Phe Phe Tyr His Phe Ser Val Leu Gln Ile Leu Gly Leu
 65 70 , , 75 80
 Val Thr Glu Val Asn Leu Asn Asn Met Leu Cys Pro Ala Ile Ser Asp
 85 90 95
 Pro Phe Tyr Gly Pro Trp Tyr Arg Ile Trp Ala Ser Gly His Gln Thr
 100 105 110
 Leu Met Thr Met Thr His Gly Lys Leu Val Ile Leu Phe Ser Tyr Met
 115 120 125
 Ala Gly Pro Leu Cys Lys Tyr Leu Leu Asp Leu Leu Arg Leu Pro Ala
 130 135 140
 Lys Lys Ile Asp *
 145 148

<210> 358
 <211> 177
 <212> PRT
 <213> Homo sapiens

<400> 358
 Met Ala Ala Ser Ala Asn Ile Glu Asn Ser Gly Leu Pro His Asn Ser
 1 5 10 15
 Ser Ala Asn Ser Thr Glu Thr Leu Gln His Val Pro Ser Asp His Thr
 20 25 30
 Asn Glu Thr Ser Asn Ser Thr Val Lys Pro Pro Thr Ser Val Ala Ser
 35 40 45
 Asp Ser Ser Asn Thr Thr Val Thr Thr Met Lys Pro Thr Ala Ala Ser
 50 55 60
 Asn Thr Thr Thr Pro Gly Met Val Ser Thr Asn Met Thr Ser Thr Thr
 65 70 75 80
 Leu Lys Ser Thr Pro Lys Thr Thr Ser Val Ser Gln Asn Thr Ser Gln
 85 90 95
 Ile Ser Thr Ser Thr Met Thr Val Thr His Asn Ser Ser Val Thr Ser
 100 105 110
 Ala Ala Ser Ser Val Thr Ile Thr Thr Met His Ser Glu Ala Lys
 115 120 125
 Lys Gly Ser Lys Phe Asp Thr Gly Ser Phe Val Gly Gly Ile Val Leu
 130 135 140
 Thr Leu Gly Val Leu Ser Ile Leu Tyr Ile Gly Cys Lys Met Tyr Tyr
 145 150 155 160
 Ser Arg Arg Gly Ile Arg Tyr Arg Thr Ile Asp Glu His Asp Ala Ile
 165 170 175
 Ile
 177

DECLARATION OF NON-ESTABLISHMENT OF INTERNATIONAL SEARCH REPORT

(PCT Article 17(2)(a), Rule 13ter.1(c) and 39)

Applicant's or agent's file reference 21272-019	IMPORTANT DECLARATION	Date of mailing (day/month/year) 15 JUN 2001
International application No. PCT/US01/02543	International filing date (day/month/year) 25 January 2001 (25.01.2001)	(Earliest) Priority date (day/month/year) 25 January 2000 (25.01.2000)
International Patent Classification (IPC) or both national classification and IPC IPC(6): C12P 21/06 and US CL: 435/69.1		
Applicant HYSEQ, INC.		

This International Searching Authority hereby declares, according to Article 17(2)(a), that **no international search report** will be established on the international application for the reasons indicated below.

1. ☐ The subject matter of the international application relates to:
 - a. ☐ scientific theories.
 - b. ☐ mathematical theories
 - c. ☐ plant varieties.
 - d. ☐ animal varieties.
 - e. ☐ essential biological processes for the production of plants and animals, other than microbiological processes and the products of such processes.
 - f. ☐ schemes, rules or methods of doing business.
 - g. ☐ schemes, rules or methods of performing purely mental acts.
 - h. ☐ schemes, rules or methods of playing games.
 - i. ☐ methods for treatment of the human body by surgery or therapy.
 - j. ☐ methods for treatment of the animal body by surgery or therapy.
 - k. ☐ diagnostic methods practised on the human or animal body.
 - l. ☐ mere presentations of information.
 - m. ☐ computer programs for which this International Searching Authority is not equipped to search prior art.
2. ☒ The failure of the following parts of the international application to comply with prescribed requirements prevents a meaningful search from being carried out:

<input type="checkbox"/> the description	<input checked="" type="checkbox"/> the claims	<input type="checkbox"/> the drawings
--	--	---------------------------------------
3. ☒ The failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions prevents a meaningful search from being carried out:

<input type="checkbox"/> the written form has not been furnished or does not comply with the standard.
<input checked="" type="checkbox"/> the computer readable form has not been furnished or does not comply with the standard.
4. Further comments:

Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Jeffrey S. Lundgren <i>Jonathan Lawrence Jr</i> Telephone No. (703) 308-0196
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